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POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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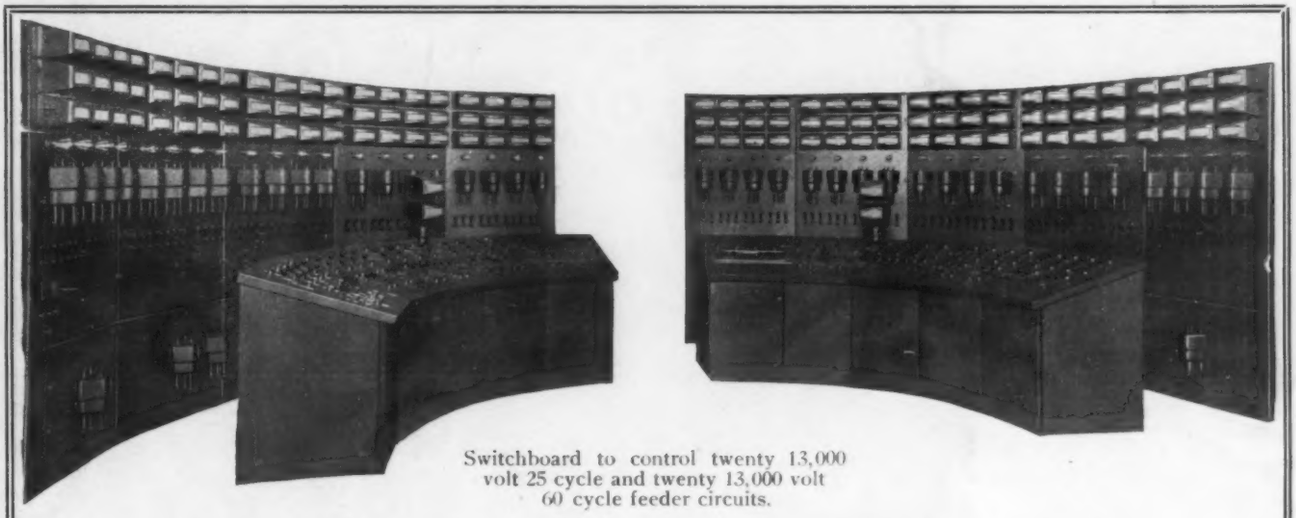

Switchboard to control twenty 13,000 volt 25 cycle and twenty 13,000 volt 60 cycle feeder circuits.

High Grade Switchboards

This feeder switchboard recently installed in one of the largest railway and lighting plants in the country illustrates the character and quality of switchboard work accomplished by experienced engineers and workmen in a switchboard factory equipped with unlimited manufacturing facilities. Every device used on G. E. Switchboards is designed, manufactured, tested and inspected by the General Electric Company.

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3088

Alphabetical Index to Advertisers, Page 8. **Where to Buy It in the West, Pages 9, 12, 18.**

FIVE YEARS' GUARANTEE on all
CABLE END BELLS, CABLE TERMINALS and CABLE POTHEADS

OUR PATENT INSIDE CLAMP RING DEVICE ON CABLE END BELLS ELIMINATES ALL LOSSES FROM EDDY CURRENTS. Installation takes from 30 to 60 minutes, except for No. 36, which requires 1½ hours, including the melting and pouring in of the compound. Our filler compound flows at about 244° F. and is made in two grades tested at 68,000 and 86,000 volts respectively, these tests being made at 60 cycles, 2/10 inch gap. We guarantee that all our bells will stand a wet test of from 2 to 2½ times working voltage. We have over 260 styles and 84 types of cable bells, cable terminals and cable potheads. Cable end bells are for service either inside or outside for any voltage up to 40,000 delta, cable terminals for 750 volt single conductor inside service and potheads for 400 volts. We are the only manufacturers in the world who guarantee material for five years and permit the customer to install the bells. We can furnish bells for clamping direct to lead cable, band iron armored cable or wire armored cable. The accompanying cuts showing the method of installation were made from actual photographs of the 13,200 volt, 250,000 c.m. cable insulation for which 74 bells were furnished for inside service and 18 bells for outside service in an order which we recently filled. We can furnish any bell sherardized or hot galvanized, but recommend the latter practice for Pacific Coast conditions. All our porcelain is of the wet process. For inside service we furnish covers of mahogany or of porcelain as desired by customer. We also manufacture a special third rail bell, which can be disconnected from the third rail with current on in one minute's time by the track men. These third rail bells are made for single or double track construction, and for feeder crossing cables up to 2,000,000 c.m. and for any number of jumper cables from the bell to the third rail. These third rail bells are made for 750 or 1500 volts service, and guaranteed as such. All cable bells shipped complete with compound. Send for our catalogue, which also contains much valuable data for engineers.

Fig. 1 shows cable pulled into conduit pipe with polygonal bushing screwed on to the pipe.

Fig. 2 shows inside clamp device screwed into polygonal bushing.

Fig. 3 shows lead sheath pulled above clamp ring to show belled-out lead.

Fig. 4 shows threaded end offinside clamp device used as templet for belling out lead sheath.

Fig. 5 shows completed 13,200 volts, 250,000 C. M. insulation completed.

ELECTRICAL ENGINEERS EQUIPMENT CO.

POWER STATION AND EQUIPMENT SPECIALISTS

10-12 N. Des Plaines St., Chicago, Ill., U. S. A.

J. C. FARRAR & CO., Agents, SAN FERNANDO BUILDING, LOS ANGELES, CAL.

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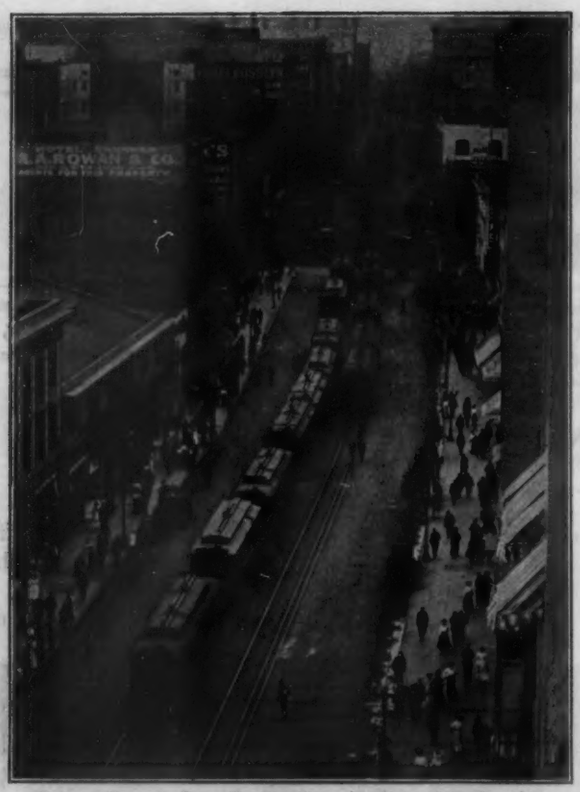
TRAFFIC CONGESTION IN LOS ANGELES.

The congestion of an enormous population into relatively small areas in the rapidly growing American cities has given rise to a new branch of modern engineering. In the cities of New York, Chicago, and Philadelphia, agitation over resultant traffic demoralization, led these cities to institute investigations of ways and means for betterment several years ago. Commissions were appointed, engineers retained and systematic study undertaken. The result has been that out of chaos and confusion well-regulated traffic balance is being maintained throughout the great cities of the East.

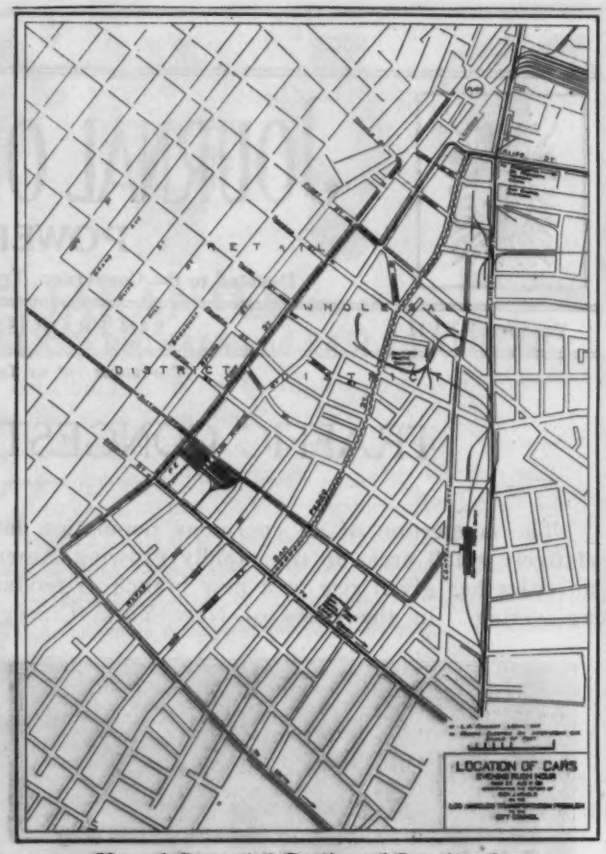
Los Angeles Car Congestion on Main Street. It is hoped to remedy this evil in the Southern California city by routing the Suburban Cars on San Pedro.

The unprecedented growth of the cities of the West has created conditions new and unencountered in the slow and steady growth of eastern cities. All of the larger coast cities are today suffering from want of proper and systematic planning in the handling of the enormous suburban crowds flooding the business districts during certain hours of the day. The first city to actually employ an expert versed in traffic congestion experiences is Los Angeles. San Francisco has recently followed her example and it is to be hoped that immediate and effective recommendations will be made and acted upon to take care of the paralyzed condition there met with due to the recent influx of people anticipating early activities to be brought into life in the working out of the details of the Panama-Pacific Fair.

In the study of conditions at Los Angeles and in fact in the case of San Francisco, Bion J. Arnold,



One mile of Car Congestion in Los Angeles on Main Street.



Map of Congested Portion of Los Angeles.

the well known traffic expert of Chicago, is retained. A partial report for betterment of conditions at Los Angeles has just been made and interesting recommendations are now being acted upon.

Bio. J. Arnold, the Noted Traffic Expert, Who is Conducting an Investiation in Los Angeles and San Francisco.

Bion J. Arnold has submitted his report on the traffic congestion in Los Angeles and the same has been approved by the Municipal Railroad Committee and will be acted upon soon by the City Council. Mr. Arnold's report is very interesting and points out indirectly the immense growth of Los Angeles during recent years.

It is proposed to take the interurban cars from Main street to San Pedro. Two plans are proposed for the building of the line on San Pedro, one plan is for the city, at a cost which Mr. Arnold estimates to be about $130,000, to build the railroad itself. The other is for the city to have the traffic companies build the railroad with the stipulation that the City of Los Angeles be allowed in time to take the road over. Mayor Alexander has sent a message to the City Council suggesting these two methods as to how the railroad should be financed.

In his report Mr. Arnold discusses the congestion on Main street at length. He states that fully 5000 riders on both systems are delayed from five to forty minutes during the rush hours each day and as many more are inconvenienced during the rush hours due to the fundamental defects of the transportation arrangements in Main street.

He also speaks of the inconvenient arrangement for getting in and out of the Pacific Electric depot at Sixth street and of the clashes that occur. Inside the station the arrangements are imperfect..

The following is an abstract of Mr. Arnold's interesting report:

All interurban cars using this terminal must wait their turn to discharge and load passengers, and no provision has been made, by means of storage tracks, to supply trippers or extras to take the place of

delayed cars. The loading arrangements are not designed to handle crowds conveniently or comfortably. In order to take a car one must stand before a closed gate until his car is called and as the schedule becomes disarranged during the blockade there is no way of telling when any particular car is to be expected. Frequently the delays to the standing patrons becomes exceedingly tedious, and when the car does come there is a general scramble and contest to obtain a seat. The height of the car steps above the ground-level platform makes loading slow and inconvenient, especially to passengers with hand baggage.

The cars leave the terminal slowly, as they must find their place in the procession of local cars and at every street intersection the entire line of mixed traffic is further delayed, either by crossing cars and vehicles, or by surface cars weaving their way in or out of the file. At one place (Third and Main streets), the intersecting line becomes part of the main line for a short distance, causing a double delay, which is made worse by the overhang of the cars and the spacing of the track centers on the curves which permits only one car to pass at a time. The fact that the cars from different systems and routes are alternated prevents the moving of the cars across the intersections in lots of two and three at a time, and as it is hard to tell whether a car is going straight ahead or is to turn a corner, both the vehicle traffic and the pedestrian travel are considerably delayed at nearly every street crossing.

As a rule the schedule provides for a liberal number of seats, but the Main street difficulties introduce delays which reduce the car supply just at a time when the system should be working at its maximum capacity.

There are apparently two financial and franchise plans by means of which the proposed tracks on San Pedro street could be built.

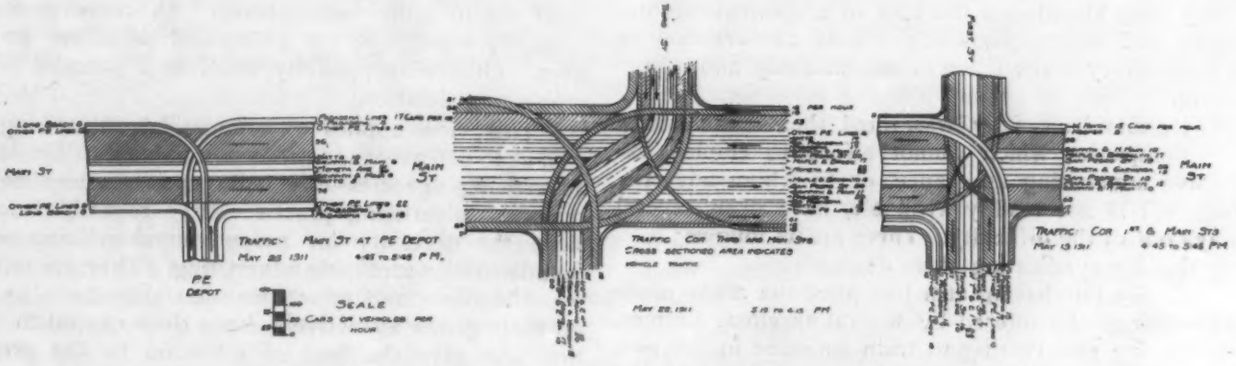
One plan, which might be called the immediate municipal ownership plan, would be for the city to construct the tracks with its own funds as part of the proposed municipal railroad and enter into an arrangement with the Pacific Electric company for the use of these tracks on a rental basis.

The other plan, which may be termed the ultimate municipal ownership plan, would be for the Pacific Electric Company to build tracks under an agreement that the city is to have the right to purchase the tracks at any time at actual cost, and that as soon as a permanent right of way can be provided by means of an elevated or sub-surface structure, the company will withdraw its interurban cars from the street surface. This latter plan would practically be an indeterminate franchise, which is sometimes called a tenure during good behavior, and is a form of permit for public utilities which is rapidly growing in favor, as it combines the advantages of both the short term franchise and the long term franchise without their objectionable features.

It is not the intention of this preliminary technical report to discuss at length the comparative merits of these two plans. With proper precautions either form of agreement will accomplish the result desired, and that is to relieve the Main street congestion by allowing the use of San Pedro street for the interurban cars as a temporary expedient pending the development of a permanent and independent terminal for the Pacific Electric system. As any agreement would not be a permanent one, it would seem that the result to be accomplished is of greater importance than the method selected to secure the improvement.

WORLD EXPOSITION PLANS IN JAPAN:

The authorities of the city of Tokyo have decided to give a grant of $3,500,000 gold to the International Exhibition which will be held there in 1917. Of this sum $1,500,000 will be devoted to the acquisition of land for the site, $1,250,000 for constructing gardens, and the remaining $750,000 to provide an adequate tram, train, and cab service, to make provision for sanitary arrangements, to cover the preliminary expenses for plans, guides, etc., to arrange a thoroughly efficient fire service, and to construct the section containing the city exhibits.



DIAGRAMS SHOWING MOVEMENT OF TRAFFIC ON MAIN STREET, LOS ANGELES.
Width of Band Represents Number of Cars and Vehicles per Rush Hour.

40 per cent of the cars on the local system, and 60 per cent of the interurban cars are affected by the Main-street Congestion.

There are three principal points of congestion along Main Street. At the Pacific Electrical Terminal—at Sixth and Main Streets the interurban cars enter and leave their "stub end" terminal by means of double track intersecting curves.

At Third and Main Streets, the Third-Street tracks not only intersect the Main-Street tracks, but parallel them for a short distance, and the curves here allow only one Third Street car to cross at one time.

At First and Main there are two sets of curves; one to allow the interurban cars to leave Main Street, and the other between the North Main Street and the West First Street tracks.

ADVERTISING GAS AND ELECTRIC SERVICE.[1]

BY WILLIAM H. HODGE.[2]

Advertising gas and electric service in newspaper space does not differ in essentials from advertising any other retail business. Success lies in studying the market, presenting the attractive points of what is offered for sale and doing these things in a systematical, careful way.

Utility organizations in cities of more than 75,000 people are large enough to hire individual advertising ability. If they do not do so they are short-sighted. .

Successful advertising on a large scale must be handled by men who have spent years learning how. They should be employed by the advertiser, receive their entire compensation from him and accept no commissions from publishers. They cannot impart their experience, knowledge and skill to others no matter how willing they are to instruct any more than a successful lawyer can tell other lawyers how to win cases, or a good merchant can transmit to his neighbor the secret of running a paying department store. Advertising for central stations, gas companies, shoe stores, breakfast foods, real estate or any other service or commodity can be productive or expensive. It all depends upon how it is done.

The smaller central stations and gas companies often find it impractical to employ special advertising assistance. The smaller organizations need the service which efficient advertising can render even more than the large organizations, for the smaller the city the greater is the proportion of possible business which the company requires in order to pay interest and dividends.

Leaders in utility operation pointed out some years ago that there must be a limit to development producing lower costs of manufacture and distribution, and that the volume of sales must be increased, and a close margin be maintained between costs and selling prices, if the gas and electric industries were to justify their commercial existence. Most utility organizations have realized the force of these conditions and have greatly improved their sales methods. They have abandoned the idea of a spontaneous demand and have acknowledged that the creation of a satisfactory market lies in salesmanship and advertising.

Results have fully warranted these conclusions.

Companies which cannot afford to employ exclusive advertising assistance, or to whom advertising skill is not readily available, have open several ways out of the difficulty. Three are as follows:

1. By syndicating their demands.
2. By purchasing at a low price the ready made advertising copy offered by several excellent sources.
3. By endeavoring to train someone in the new business force to do the work in conjunction with the material offered by manufacturers.

Syndicating the publicity requirements of a number of stations enables the employment of copy service for each by prorating the cost. It is in line with modern utility operation.

Criticism of so-called "canned copy"—that is, ready made ads—has no particular weight. An electrict flat iron is an electric flat iron the world over, and people use it for the same purposes and are attracted by the same features. Gas ranges are used for cooking in New York, San Francisco, Mexico City and Montreal. National advertising campaigns for all kinds of commodities cover the country with identical and simultaneous copy. "Canned copy" has nothing inherent to make it defective. If the matter and ideas are good, they are good any place. If they are bad they are not worth while using. Neither is any other advertising literature.

The third plan suggested is not as reliable as the others, but has interesting potentialities. Manufacturers supply creditable electrotypes and copy, and suppress the individuality of their own goods for the interests of utility companies. Few managers have the slightest idea of what this service costs the manufacturers. It is higher than generally supposed. Use of the service often entails mutual obligations which the company, on its part, does not care to assume.

An impression prevails among utility managers that they should buy and use local newspaper space as a matter of policy, if for no other reason. This is an unhealthy theory and is gradually being dropped. It does not help to make commercial advertising pay, although it is possible to do so, and is an attitude which is difficult to defend.

Whenever a utility company has a public controversy on hand it can make no better or wiser move than to present its side of the case in the daily newspapers. Advertising space at current rates should be bought. The contents of the advertisement should be skillfully prepared.

No municipal ownership agitation intelligently met in this way has resulted in the construction of a publicly owned and operated utility. My own experience with this latter kind of publicity has been broader than in commercial advertising lines, and has extended pretty well over the country, the Pacific Coast included. It must have solid, substantial backing in actual conditions or it cannot be of more than superficial aid to utility management. In other words, a company must have the goods and be willing to deliver. Otherwise publicity work as a panacea is an interesting delusion.

This view applies to commercial advertising as well as to defensive and protective publicity. The large advertising agencies—the real exponents and developers of advertising practice—have recently emphasized the necessity for proper merchandizing as a foundation for profitable advertising. They are telling manufacturers and merchants that they have to put up their goods attractively, keep their capital in motion and give the best of attention to the precise terms upon which they offer their wares to the public or the cleverest advertising will not much help them.

One of the best things advertising does is the self analysis which it exacts. The ad-writer is compelled to search for points of attractiveness; to assemble the facts which would make the purchaser want to buy. If he cannot find them, and the article has intrinsic merit, something is wrong with the sales scheme.

[1]Written specially for the Journal of Electricity, Power and Gas.

[2]Publicity Manager for the H. M. Byllesby Companies.

Often the ad-writer picks out the faults and suggests corrections.

Many utility companies, large and small, have made advertising profitable and satisfactory. Any utility can make advertising pay by giving the subject the attention which it deserves.

ELECTRICAL ACTIVITY IN INLAND EMPIRE.

Carl R. Gray, president of the Spokane & Inland Empire Electric Railway Company says in the fifth annual report, just issued, for the year ended June 30, 1911, that while the street railway system in Spokane shows an increase in revenue over the year before, there were decreases on the interurban lines in northern Idaho and eastern Washington. However, he takes an optimistic view of the situation and predicts increased earnings for the coming year.

The total revenues from transportation for the year were $1,669,638.07, a decrease of $93,976.34 from last year, while the operating expenses amounted to $1,194,578.34, an increase of $112,410.71 over 1910. The average expense per mile operated was $5,740.40, an increase of $512.54. The net operating revenue was $745,059.73, a decrease of $206,387.95 from 1910.

The freight revenues were $399,980.92, a decrease of $72,937.36 from last year, and the passenger revenues $620,882.67, a decrease of $134,725.15 from the report for 1910. The street railway system showed a revenue of $549,110.89, an increase of $62,992.23, while other revenues amounte dto $99,663.59, an increase of $60,693.94 over last year.

Property investment, $5,282,620.54; material and supplies, $308,345.50; cash, $25,858.38; due from roads, companies and individuals, $77,273.63; sinking fund; $18,751.45; sundry expense accounts, $5,002.05, making a total of $25,718,852.63, while the liabilities include: Capital stock, common, $10,000,000; preferred rights, $6,409,100; first mortgage bonds, $4,951,500; payroll, audited accounts, vouchers and accounts, $281,147.97; bills payable, $3,667,448.64; accrued bond interest and taxes not yet payable, $94,472.49; accrued interest in floating debt, $2,711,28; sinking fund reserve, $14,584.60; sundry expense account, $16,-604.99; profit and loss, $281,282.66; total, $25,718,-852.63.

President Gray shows in closing his report that the physical condition of the property is excellent, adding that the roadbed has been kept in first class condition, with good banks, tie renewals have been made when necessary and ballast has been applied to practically the entire mileage. It has been the policy of the company, in order to build up industries along its lines, to put in spure and sidings whenever business promises.

"Your lines," he says, "are built through a rich and developed country. On the inland division the Palouse country is harvesting this year an unusually large crop and we anticipate increased earnings for the coming year's operation. There is no new construction work contemplated, nor will there be unusual improvements calling for any large investment of money."

EVAPORATIVE TESTS ON A WATER TUBE BOILER.[1]

BY R. F. CHEVALIER.

Test of January 5, 1911.

The fires were lit under the boiler on the evening of the 4th and light fires maintained through the night. At 8:00 a. m., January 5th, steam was taken from the boiler so that the fires might burn at their rated capacity. The test was started at 9:00 a. m. and continued until 5:00 p. m. During the test, the fires were attended to by a regular fireman, who adjusted the fires according to instructions. The draft regulation was attended to by the writer. The boiler tested had been in operation since November 30, 1910. Prior to the test, the water had been drained from the boiler and the internal surfaces inspected. In the lower and intermediate steaming elements, there was no deposit of scale. In the feed water element, a slight scale was found, the thickness of which was about 1/32 of an inch. Both drums had a soft, slushy mud for the full length of the bottom and about 6 inches deep. This mud was removed and the drums washed. None of the tubes were cleaned internally. The soot was thoroughly blown from the heating surface on January 4th.

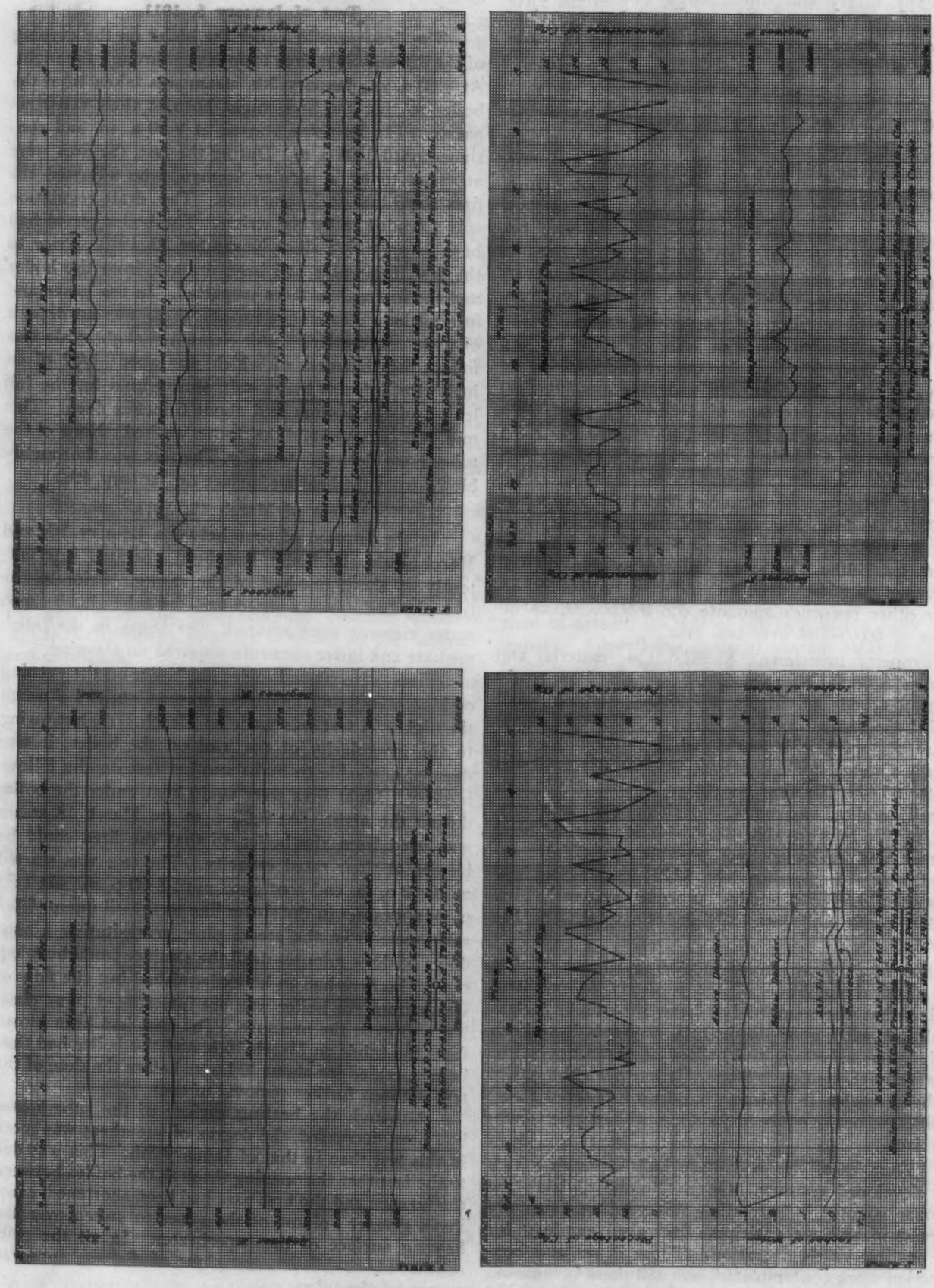
Test of March 18, 1911.

In the interval of time between January 5th and March 18th, the boiler had been operated intermittently at about one-half of the rating. Prior to the test, the boiler was opened and the tubes in the feed water element were scraped. The tubes in the intermediate and lower elements required no cleaning.

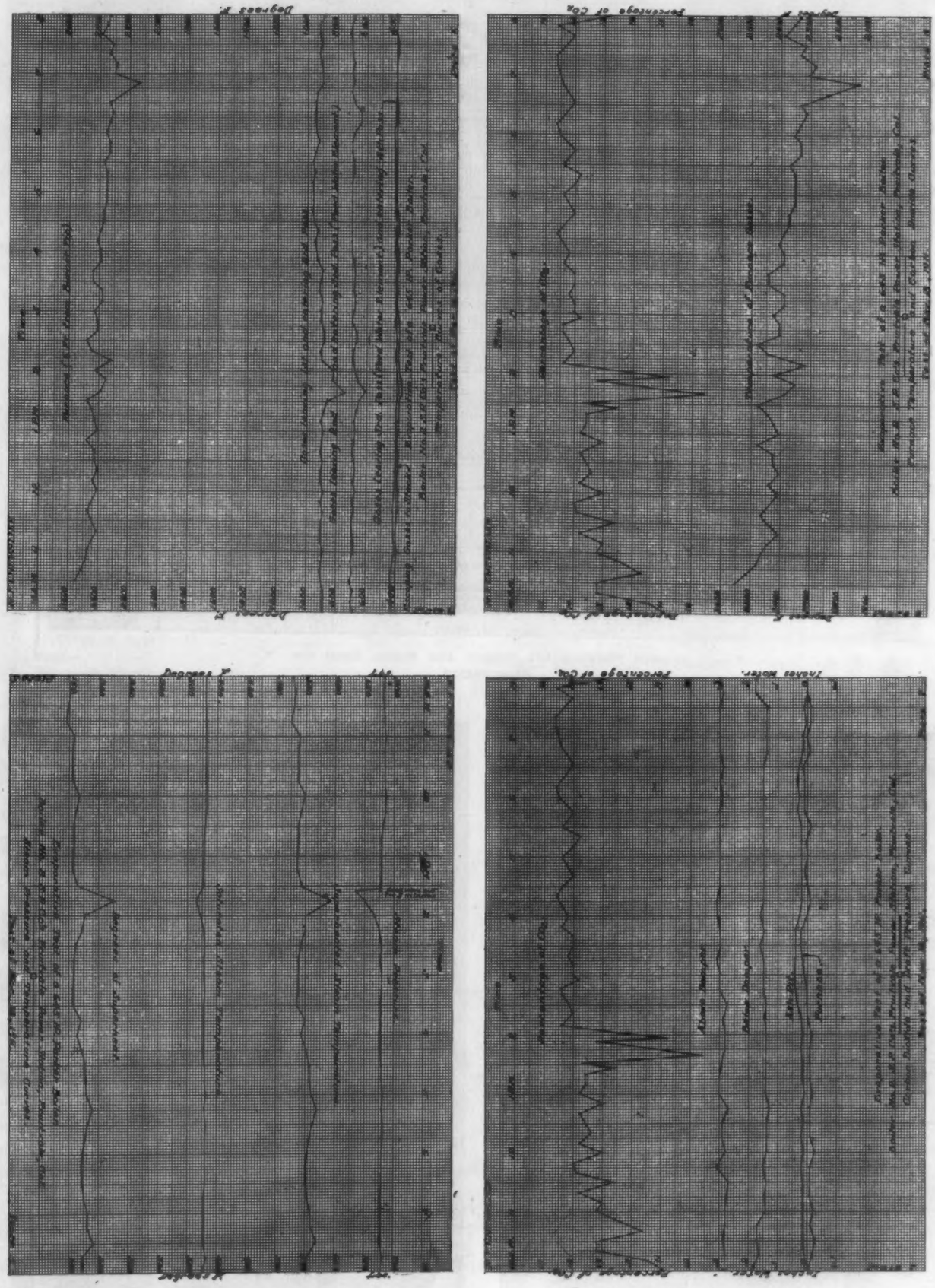
Fires were started under the boiler on the evening of March 16th and moderate fires maintained through the night. A test was made on March 17th, but owing to the irregularity of the load on the boiler, it was deemed advisable to make another test on the following day. Light fires were again kept under the boiler during the night. At 9:00 a. m. on March 18 steam was used from the boiler so that the fires could be burned at their rated capacity. The test was started at 10:00 a. m. and continued until 8:00 p. m. At 1:33 p. m. a strainer in the steam line to the oil pump, filled with scale from the steam pipe, necessitating a shut down of three minutes until the strainer could be taken out. The fires had to be extinguished but the flow of steam from the boiler was not interrupted, thus causing a drop in the pressure. The soot had been blown from the tubes on March 16th, and the boiler had thus been operated for about 30 hours before the time of the test without further removal of soot.

Although the heating surface of the superheater had been decreased, the degree of superheat was more in this test than in that of January 5th. This was due to the fact that the opening through the baffles between the furnace and the first pass had been shortened, causing a greater volume of the gases to sweep over the heating surface of the superheater. In all the tests conducted, no blisters nor signs of distress appeared on any of the tubes.

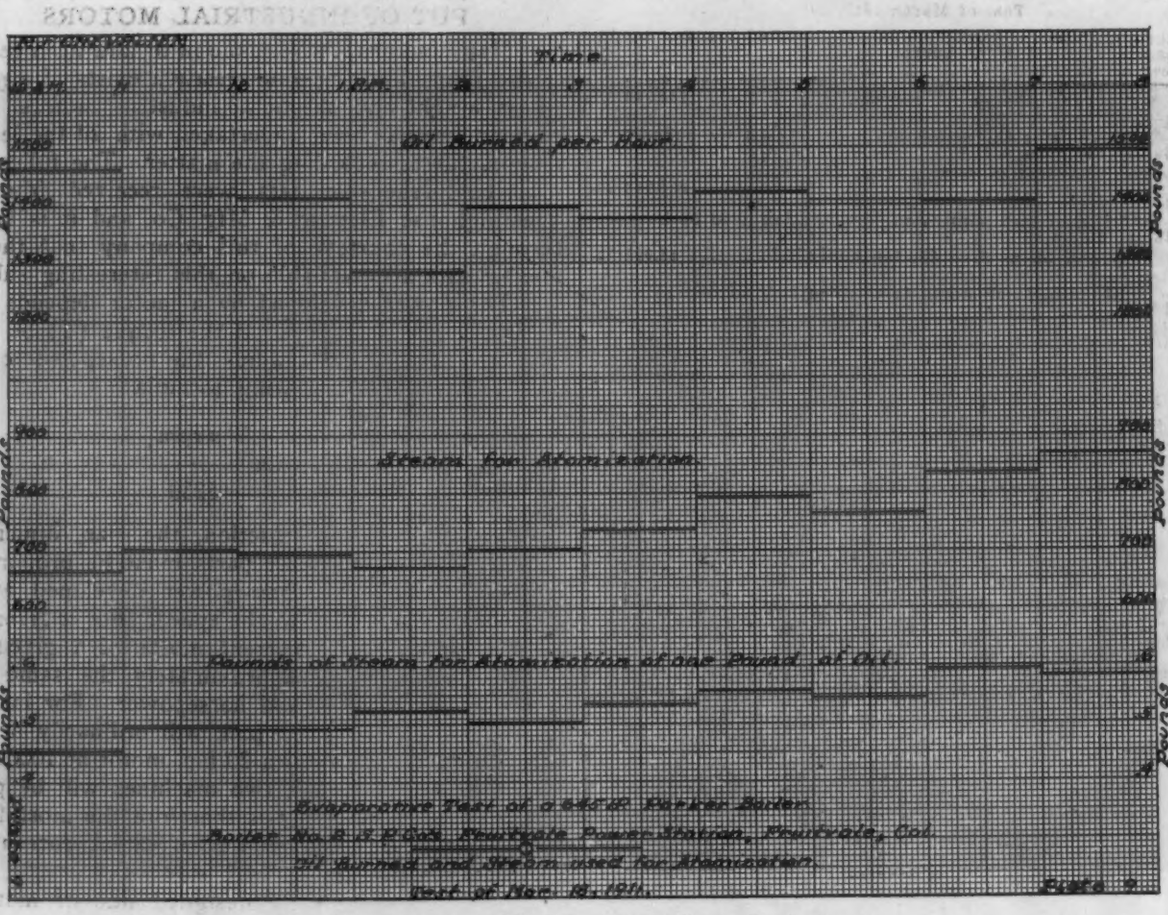
[1]Continued from issue of October 7, 1911.



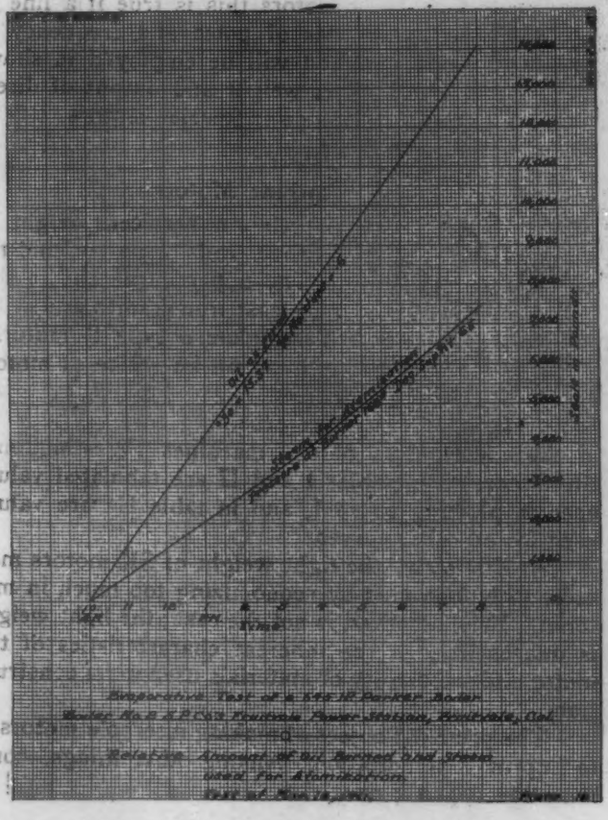
Curves Illustrating Test of 645 H.P. Parker Boiler on Jan. 5, 1911.

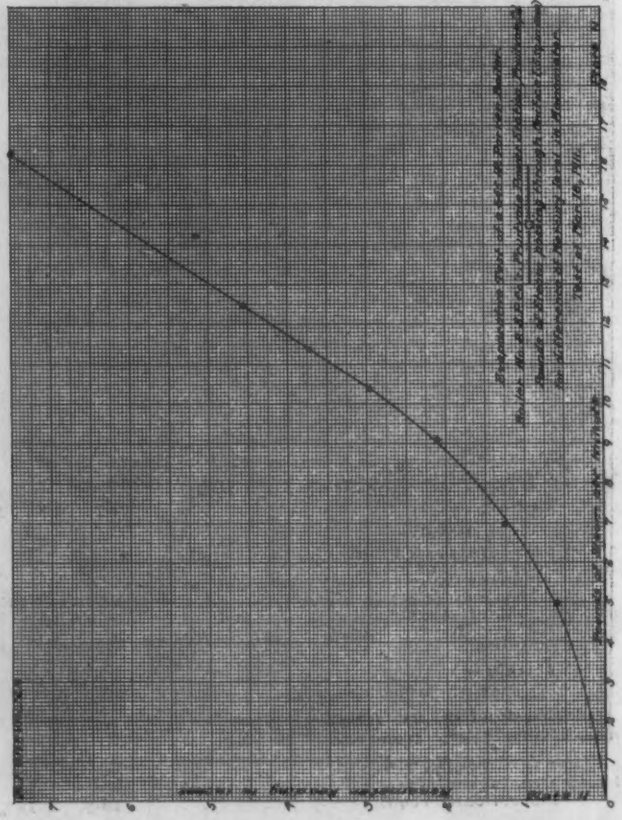


Curves Illustrating Test of 645 H.P. Parker Boiler on March 18, 1911.


Time
Oil Burned per Hour
Steam for Atomization
Pounds of Steam for Atomization per Pound of Oil.
Evaporative Test of a 642 H.P. Parker Boiler
Boiler No. 2 at the Pueblo Power Station, Pueblo, Col.
Oil Burned and Steam used for Atomization.
Test of Nov. 21, 1911.

Curve Showing Oil Burned and Steam Used for Atomization.


Time
Evaporative Test of a 642 H.P. Parker Boiler
Boiler No. 2 at the Pueblo Power Station, Pueblo, Col.
Relative Amount of Oil Burned and Steam used for Atomization.
Test of Nov. 21, 1911.



Relationship of Steam Required for Atomization of Oil. Calibration of Orifice Used in Measuring Steam for Atomization.

STEAM USED BY BURNERS FOR ATOMIZING THE FUEL OIL
Test of March 18th, 1911.

Pressure of steam at burner.....168 lbs. per sq. in.
Temperature of steam at burner..... 440° F.
Degrees of superheat..... 65° F.
Total steam used by burners for ten hours ..... 7,441 lb.
Total water fed to boiler for ten hours ..... 189,240 lb.

$\frac{7,441}{180,240}$ = 4.16% of total water evaporated used by burners to atomize oil.

Equivalent evaporation from and at 212° F. for ten hours .....224,218 lb.

$\frac{7,441}{224,218}$ = 3.32% of total equivalent evaporation used by burners.

Total weight of oil as fired for ten hours.....14,093 lb.

$\frac{7,441}{14,093}$ = .528 pounds of steam to atomize 1 lb. of oil.

RESULTS OF EVAPORATIVE TESTS ON A 645 H.P. PARKER BOILER AT THE S. P. CO.'S FRUITVALE POWER STATION, FRUITVALE, CAL.

1.	Date of test (1911)	Jan. 5th.	Mar. 18
2.	Duration of test (hours)	8	10
3.	Type of burner (Internal Mixer)		
4.	Make of burner (Owens)		
5.	Number of burners used	3	3
6.	Water-heating surface—sq. ft.	6080.	6080.
7.	Superheating surface—sq. ft.	134.4	107.5
	Average Pressures—		
8.	Barometer—inches	30.4	30.1
		lbs. sq. in.	
9.	Steam pressure by gauge (saturated)	178.5	179.7
10.	Oil pressure at burner	78.	92.
		ins. water	
11.	Force of draft in flue after damper	.31	.294
12.	Force of draft between damper and boiler	.165	.15
13.	Force of draft in furnace near superheat.	+.01	+.016
14.	Force of draft in ash pit	.02	.02
	Average Temperatures—		
15.	External air	degrees. F.	
16.	Fire room	75	78
17.	Air entering ash pit	75	81
18.	Furnace (6 ft. from burner tip)	2275	2390
19.	Gases entering 1st pass	1680	
20.	Gases leaving 1st pass and entering 2d	885	915
21.	Gases leaving 2d pass and entering 3d	610	690
22.	Gases leaving 3d pass and entering 4th	400	420
23.	Escaping gases from boiler	384	394
24.	Oil at burner	128	113
25.	Feed water entering boiler	165	123.4
26.	Superheated steam	539	561.2
27.	Saturated steam before superheated due to pressure	379	379.5
28.	Degrees of superheat	160	181.7
	Fuel—		
29.	Kind—California crude oil		
30.	Gravity of oil at 60° F.—specific	.9700	.9627
31.	Gravity of oil at 60° F.—deg. Be	14.43	15.37
32.	Percentage of water in the oil—%	1.2	0.6
33.	Calorific value of dry oil per lb—B.t.u.	18513	18681
34.	Weight of oil as fired—lbs.	11841	14093
35.	Weight of oil consumed corrected for moisture—lbs.	11699	14008
36.	Vol. of moisture free oil consumed—bbls	34.5	41.56
	Fuel: Average per Hour—		
37.	Oil consumed per hour as fired—lbs.	1480	1409
38.	Oil consumed per hour corrected for moisture—lbs.	1462	1401
39.	Volume of dry oil consumed per hr—bbls	4.31	4.15
40.	Oil per hour corrected for moisture per cu. ft. of furnace volume—lbs.	2.195	2.1
41.	Oil per hour corrected for moisture per sq. ft. of heating surface—lbs.	.24	.23
	Water—		
42.	Total wgt. of water fed to boiler—lbs.	156974	180240
43.	Factor of evaporation	1.19	1.244
44.	Equivalent evaporation from and at 212°—lbs	186799	224218
	Water: Average per Hour—		
45.	Water evaporated per hour—lbs.	19621	18024
46.	Equivalent evaporation from and at 212°—lbs.	23350	22422
47.	Equivalent evaporation from and at 212° per sq. ft. of water heating surface—lbs.	3.84	3.69
48.	H.P. developed A.S.M.E. rating—H.P.	676.7	650
49.	Builders' rated H.P.—H.P.	645	645
50.	Percentage of builders' rating developed—%	105%	100.8%
	Economic Results—		
51.	Water evaporated under actual conditions per lb. of oil as fired—lbs.	13.256	12.79
52.	Equivalent evaporation from and at 212° per lb. of oil as fired—lbs.	15.775	15.91
53.	Equivalent evaporation from and at 212° per lb. of oil corrected for moisture—lbs.	15.967	16.01
	Efficiency—		
54.	Efficiency of the boiler—%	83.66%	83.13%
	Analysis of the Dry Gases by Volume—		
55.	Sample taken from gases leaving 1st pass at	L	L
56.	Carbon dioxide (CO_2)—%	13.05%	13.5%
57.	Percentage of excess air above amount theoretically required—%	18%	14%

RELATION BETWEEN WEIGHT AND OUTPUT OF INDUSTRIAL MOTORS.

Many inquiries have come in of late from readers of the Journal asking what relation exists, if any, between weight and output of industrial motors. Correspondence has been undertaken with all the leading manufacturers regarding the matter. The fullest and most comprehensive data were received from the Westinghouse Electric & Mfg. Co. and it is largely through the courtesy of this company that the following data are available on this interesting subject:

The power developed by a motor depends upon its torque and its speed. If the torque (T) be given in pounds at one foot radius, the horsepower can be calculated by the following formula:

$$\text{H.P. equals } \frac{T \times rpm}{5250}$$

For a given construction, the size, dimensions and weight of the motor parts must be proportional to the torque. The horsepower developed at any torque is proportional to the speed. For a given full-load torque a direct current motor of a given construction will weigh approximately the same independent of the speed and horsepower. For instance, a 10 h.p. motor at 500 r.p.m. will ordinarily be built upon the same frame as a 20 h.p. motor at 1000 r.p.m. and the weights of the two machines will be practically the same. Torque is therefore the most logical basis for comparing weights of direct current machines.

With a consistently designed line of motors a curve showing the relation between weight and square root of torque, when plotted on rectangular coordinates is smooth and nearly a straight line. In the case of induction motors this is true if a line of motors of given number of poles and frequency is considered. This method will be employed in showing the relation between weight and output of direct current and induction type industrial motors.

PART I.

Direct Current Motors.

Curve 1 shows the relation between weight of bare motor, i. e. motor without rails or pulley, and the square root of torque. The upper curve shows this relation for motors having cast iron frames and without auxiliary poles (Westinghouse type S motors). The lower curve shows the same for a line of motors having rolled steel frames, pressed steel feet and having auxiliary poles, representing a new departure in the construction of d.c. machines (Westinghouse SK motors). In tables I and II are tabulated values used in plotting curve 1, and in table III are values used for all other curves.

At first sight, the light weight of SK motors may seem to be obtained by economizing too much in material. This, however, is not the case; the light weight is due entirely to the inherent characteristics of the motor and the quality of materials used in its construction.

The principal object of making interpole motors is to improve commutation. Among other things, commutation depends on:

TABLE 1. CAST IRON FRAMES. D.C. SHUNT WOUND MOTORS, 200 VOLTS.

Rating. H.P.	R.P.M.	Square Root of Full Load Torque.	Weight Pounds.
2	1200	2.96	295
5	1300	4.5	400
7½	975	6.35	615
8	835	7.1	815
15	1000	8.88	1115
15	725	10.4	1500
20	650	12.75	1940
25	630	14.40	2460
300	600	16.20	2935
35	575	17.9	3230
40	550	19.6	4230

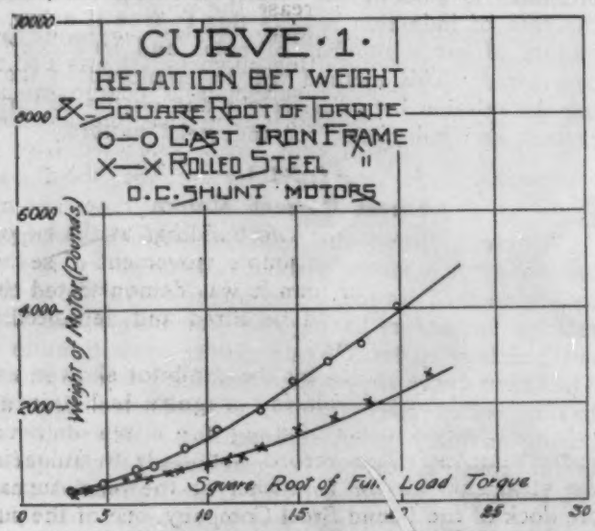
TABLE 2. ROLLED STEEL FRAMES. D.C. SHUNT WOUND MOTORS, 230 VOLTS. RATINGS AND WEIGHTS.

Rating. H.P.	R.P.M.	Square Root of Full Load Torque.	Weight Pounds.
2	1200	2.96	180
3	1100	3.78	250
5	1100	4.9	325
7½	1150	5.85	440
7½	975	6.36	460
10	1150	6.84	500
10	850	7.85	600
15	1100	8.45	665
15	825	9.74	790
20	900	10.8	895
20	750	11.8	985
30	975	12.7	1115
30	725	14.7	1460
40	775	16.5	1740
40	600	18.7	2040
50	565	21.6	2600

1. Ratio of the number of armature ampere-turns to the number of field ampere turns.

2. Air gap.

For good commutation a non-interpole motor must have a strong field, i. e. a large amount of copper on the field poles and a large cross section of magnetic circuit. The counteracting ampere turns produced by the armature current must be comparatively small; hence, the number of turns on the armature must be



Graphic Relation Between Weight and Output of Direct Current Motors.

kept down. The air gap must also be large so as to offer sufficient reluctance to the magneto-motive force produced by the armature ampere-turns and to produce a stiff field, i. e., a field not easily distorted by armature reaction.

In an interpole motor, however, the armature ampere turns are counteracted by the interpole windings. More armature turns, a smaller air gap, lighter field coils, and smaller cross section of the entire magnetic circuit are, therefore, possible. The reduction in the cross section of the magnetic circuit does not effect the rigidity of the motor, since the section necessary for magnetic purposes is far in excess of that required for mechanical strength.

All these principles have been utilized in the design of Westinghouse SK motors. With a slightly decreased air gap and the use of interpoles and pressed steel feet, the weight of the motor has been considerably reduced below the weight of the older type of motor, without sacrificing electrical performance or mechanical strength.

LABOR DISPLACING MAGNETS.

Illustrative of the different viewpoints human beings have regarding the progress of a great industry and the results thought to be brought about in the advancement of the race, we print the following from the Social-Democratic Herald of Milwaukee, a Socialist organ. Our own views will be found on the editorial page.

Magnets! Lifting magnets! These labor-saving —or rather labor-displacing devices have been on the market for about four years, but their importance in reducing the number of names on the pay rolls of the capitalists' institutions have been realized only within the last twelve or eighteen months. But within that time their introduction has added thousands of men to the army of unemployed and within the next two years their further use will add tens of thousands to the already overcrowded army.

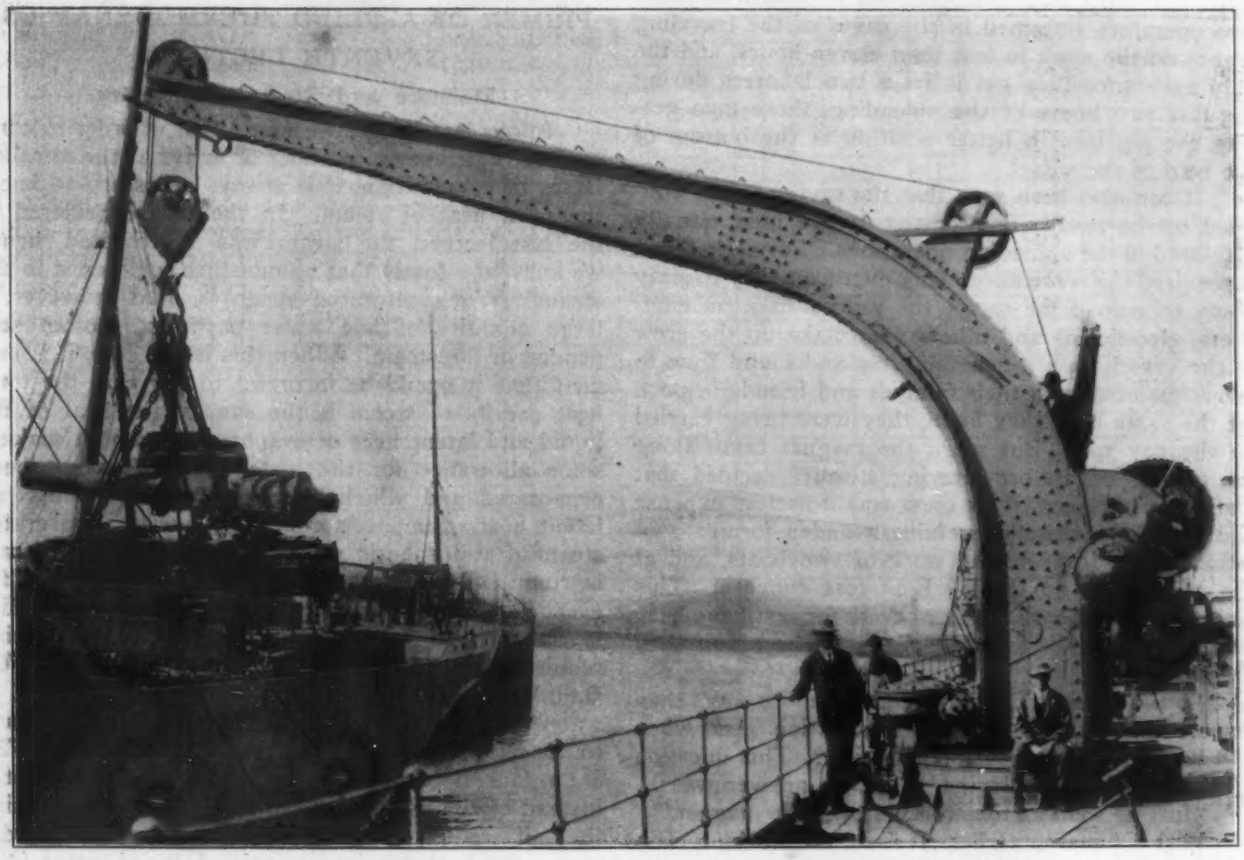
One day last May, Ralph Korngold of Los Angeles, Cal., and the writer watched two of these lifting magnets unloading scrap and pig iron at the Homestead plant of the Carnegie Steel Company.

"Those two young men operating the two magnets from the cages of those traveling electric cranes are now doing the work it formerly required twenty-five men to do," said the foreman of the department in reply to an inquiry.

Further inquiry developed the fact that the two young men operators of the cranes and magnets did the work so rapidly that they were employed only part of the time, while the twenty-five men who formerly did the work were employed all of the time.

In fourteen other parts of the works we found the same kind of magnets had performed the same kind of service in the way of decreasing the pay roll lists, which in cold figures means that twenty-eight men are now employed part of the time, where formerly it required 350 workers to remain constantly on the job. And the end is not yet, for more and more of these labor-displacing and increased profit-making devices are to be installed in other departments of the mill.

The following week we made a visit to the plants of the Crucible Steel, the American Steel and Wire, Mackintosh & Hemple, National Tube, Jones & Laughlin and other companies in the smoke belt, and the magnets at all of these places were in evidence equally as strong. At the South Side works of Jones



Magnets! Lifting Magnets!! The kind of Derrick Displaced by New Electric Device.

& Laughlin the superintendent of one of the departments made this startling statement:

"A few years ago, not farther back than 1907, the employing capacity of these works was 10,000 men. Now we can turn out more material with 4,000 than we formerly could and do the work cheaper, too."

"What became of the 5,000 men?" he was asked.

"God, I don't know. We put a machine in the brass-finishing department last week and it put eighteen skilled workers out of jobs. And we shall never need them again to do that kind of work. Why if this thing keeps up we shall not need men at all to run the mill. At least not many. The engineers are constantly figuring on labor-saving devices. We scarcely need any skilled men any more. The machine has the brains and any kind of a man with ordinary intelligence can make the machine do the work. I tell you the men around here are getting scared. They can see their opportunity of having jobs becoming more insecure every day. This certainly is the age of invention in the way of labor-saving devices. That is about all the bosses seem to be thinking about these days."

The first day in June the writer, in company with Alexander Irvine of New York, went to see the exhibit at the Western Exposition building at Pittsburg, where we found on view all kinds of new machines for the benefit of the delegates to the American Foundrymen's Convention. There we saw magnetic separators, wood-carving machines, improved lathes, adding machines, sand-mixers, improved sand molds, etc., all of which were on the market to be sold to the foundrymen, coal operators, and owners of steel plants and big machine shops, the inducement to buy always including the argument that "their use would decrease the pay roll list and increase the profits."

In this great machinery exhibit we found one of the labor-displacing lifting magnets. It was a sixty-two-inch affair and the salesman in charge of this display advanced the information that the harmless looking device was capable, when connected with an electric wire, of lifting from ten to fifteen tons. One of the magnets was connected with a crane that had been erected between the two buildings at the exposition grounds, and by the simple movement of several levers operated by one man it was demonstrated that scrap and pig iron could be lifted and deposited at the will of the operator.

Literature supplied by the exhibitor showed that two of these labor-displacing magnets had unloaded 4,000,000 pounds of machine pig iron in ten hours and thirty minutes. This record was made in unloading the steamship Erwin L. Fisher at the blast furnace ore dock of the Island Steel Company, one of the subsidiaries of the steel trust, at Indiana Harbor, Ind.

The steamship docked at 7:15 a. m., and the work of unloading began at 7:35 a. m. and was completed at 5:35 p. m. The boat cleared at 7:20 p. m. the same day. As work was suspended for thirty minutes at noon the actual time for unloading was only ten and one-half hours.

Before the introduction of the magnets it required the services of twenty-eight men working two days and two nights to unload a boat of this capacity. Now

two operators stationed in the cages of the traveling cranes do the work in less than eleven hours, and the only assistance they get is from two laborers during the last two hours of the unloading, these men getting the pig iron in better position at the bottom of the hold of the vessel.

It can also been seen that the saving is not confined to the twenty-four or twenty-five men actually displaced in the unloading operations. Formerly when it required the services of many men from fifty to sixty hours to unload the cargo, the sailors, firemen, engineers, electricians and others who make up the crew of the vessel, took a generous rest and found time to get acquainted with their families and friends in port. At the same time they knew they were being carried on the pay roll. But when the magnet came along the owners of the ore-carrying steamer decided that loafing on the part of its crew was a useless expense and now one vessel's usefulness under former conditions is made to do the work of two boats, and at the same time do the work at less expense. This means that the hours of the workers for rest have been decreased, and not so many men will be required at the ship yards.

So the Socialists in Milwaukee in more ways than one are hastening the day of emancipation. And when will be the day for that emancipation? This question I asked of Comrade Irvine. And his answer was:

"Just as soon as the workers own the magnet."

Was his answer right? It is for the working class to answer at the ballot box.

FARM ENGINEERING.

Recognizing that much remains to be accomplished by applying good engineering to farm operations and to the work of land development, the management of the American Land and Irrigation Exposition, to be held at Madison Square Garden, November 3 to 12, has appointed Putnam A. Bates, a consulting engineer who has specialized in these subjects, to direct the assembly of exhibits in this division of the Exposition. It looks forward to this feature as one of the most important of the entire Land Show, and believe it will throw new light on farming methods.

The country, especially in the farming districts, is dotted with water powers, once in active use for milling purposes, but which the farmers now allow to run to waste. In one instance where the farmer was wise enough to utilize this power for an electric plant, he discovered that a four-horse-power dynamo would run sixty ordinary lights, drive a milk separator, milk the cows, turn a grindstone, a fanning mill or feed grinder, cut the ensilage, and drive a dozen other small machines. He calculated that it did the work of three hired men, besides lighting the local church and his house and stable. City comforts are fast invading country villages, as is proved by the fact that in 1909, out of 5577 central stations supplying villages and cities with power, 4357 existed in towns of less than 5000 inhabitants.

PRIMER OF APPLIED THERMODYNAMICS.[1]

SEVENTH LECTURE.

Moisture and Steam Calorimetry.

In our last lecture we found that in order to compute the efficiency of a boiler or arrive at the so-called factor of evaporation, it is always necessary to know the total heat of steam. In the case considered in the last lecture, the steam was superheated, hence we knew absolutely that no moisture could exist in the steam. When saturated steam is used, however, a large quantity of fine water particles is often suspended in the steam. When this is the case, it is evident that it would be incorrect to say that the total heat per lb. of steam is the sum of the heat of the liquid and latent heat of evaporation without making some allowance for the water which has not been evaporated and which consequently represents no latent heat. Suppose for instance we have saturated steam at atmospheric pressure, and 10% of this steam is composed of water particles. Evidently then for every pound of this mixture only 90% is in reality in the form of steam. Instead of 970.4 B.t.u. being required to form a lb. of the mixture, but .90 of 970.4 B.t.u. are required. In other words to raise a lb. of water from 32° F. to 212° F. requires 180 B.t.u., and to form the vapor in this case, an additional 873.4 B.t.u. are necessary, requiring in all 1053.4 B.t.u. instead of the usual 1150.4 B.t.u. Generally speaking then, if we have x proportion of the vapor as dry steam the heat required to raise 1 lb. of water from 32° F. to steam is $(x L + h)$ B.t.u., where x is the proportion of dry steam, L the latent heat, and h the heat of the liquid.

Practically all saturated steam contains water, varying in amount from a fraction of one per cent where the steam is generated in a properly designed boiler fed with good water, to five per cent, or even more, when the feed water is bad, or the boilers are of defective design. Not only is the heat absorbed by raising this water from the boiler feed temperature to the steam temperature practically wasted, but the water causes further loss by increasing the initial condensation in the engine cylinder. It also interferes with proper cylinder lubrication, causes knocking in the engine, and water hammer in the steam pipe.

We have hitherto found that the heat of the liquid is the amount of heat necessary to raise water from 32° F. to some other intermediate point or in saturated steam it represents the amount of heat required to raise a pound of water from 32° F. to the temperature of evaporation of the water for the particular pressure. Roughly speaking 1 B.t.u. per degree is required. This is not strictly accurate, however. Fig. 16 is a diagram from which the liquid heat may be obtained at once with extreme accuracy, the diagram having been made from Peabody's Revised Steam and Entropy Tables. This table gives at once the quantity which must be added in addition to 1 B.t.u. per degree for any temperature. With this table combined with those given in previous lectures the

[1] A resume, devoid of higher mathematics, covering the essentials of a series of lectures now being given by the editor of this Journal before the Senior Mechanical Engineering students at the University of California.

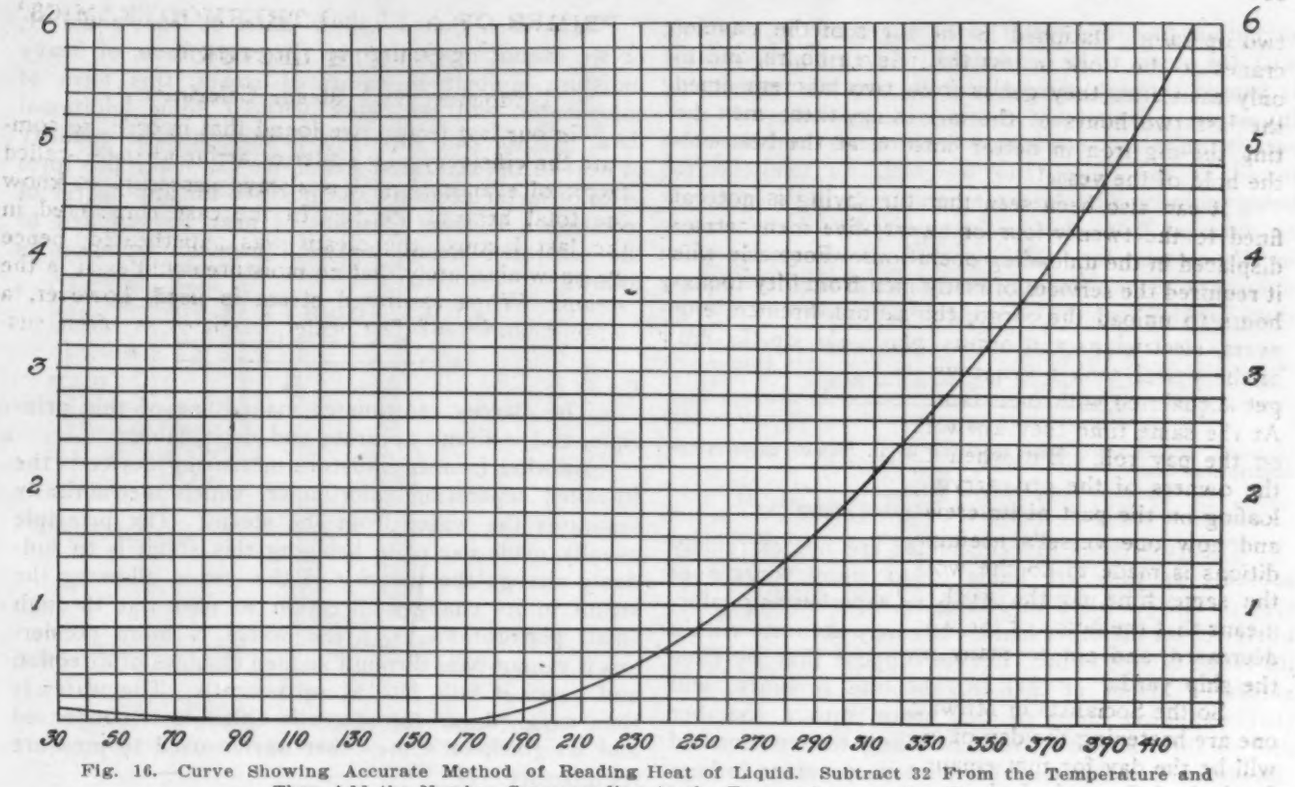


Fig. 16. Curve Showing Accurate Method of Reading Heat of Liquid. Subtract 32 From the Temperature and Then Add the Number Corresponding to the Temperature on the Chart.

student is now enabled to proceed with any problem involving steam tables.

The instrument used in engineering practice to determine the amount of water in saturated steam, or, in technical terms, to determine the "quality of the steam," is known as a steam calorimeter. The name is misleading and should not be confused with the entirely different type of calorimeter described in a previous lecture as being used in the determination of the calorific value of fuels. The several types of steam calorimeters met with in practice can be classed under five headings as follows:

1. The barrel or tank calorimeter.
2. The surface-condensing calorimeter.
3. The throttling or superheating calorimeter.
4. The chemical calorimeter.
5. The electrical calorimeter.

The design of the barrel or tank calorimeter is of simple nature, and the principle involved even more simple. A portion of the steam to be tested is passed through a hose into a barrel or tank filled with water. The weight of the water is noted before the steam is turned in, and its weight again determined after the steam application. The temperature of the water before and after the steam application is noted, and by reading the pressure of the saturated steam under observation, the list of data necessary is complete. In refined measurements, corrections for radiation and heat absorbed by the tank are made, also.

Let us suppose that the water in the tank weighs 27 lb. and that its weight is 30 lb. after the steam application is made. The water in the barrel was at 62° F. and became 175° F. after the steam application, the pressure gauge measuring the pressure of the saturated steam reading 90 lb. gauge. Let us find the quality of the steam. Now in every lb. of steam at 90 lb. gauge, or 104.7 lb. absolute, there is found from the steam tables to be 885.0 B.t.u. as latent heat and 301.9 B.t.u. as heat in the liquid. But if x lb. only are actually evaporated in every pound of mixture, the true heat which the saturated steam possesses per lb. is

$$885\ x + 301.9$$

Since 30-27 or 3 lb. of steam have been condensed in the tank, and since the tank has the temperature of 175° F., evidently the whole amount of heat given up by the 3 lb. of steam is

$$3\ (885\ x + 301.9 - 143)$$

Since the steam has parted with this heat, the water must have gained an equal amount. Hence

$$3\ (885\ x + 301.9 - 143) = 93 \times 27$$

$$\text{or } x = \frac{858.1}{885} = 0.97$$

In general we have as a heat balance for the barrel or tank calorimeter,

$$W\ (x_0 L_0 + h_a - h_1) = w\ (h_1 - h)$$

$$\text{or } x_0 = \frac{h_1\ (w + W) - wh - W h_a}{W L_0}$$

Where

W = Weight of steam,
w = weight of water,
t = initial temperature of water,
t_1 = final temperature of water,
h = heat of liquid at t,
h_1 = heat of liquid at t_1,
P_0 = steam pressure for L_0,
L_0 = latent heat at P_0,
h_a = heat of liquid in steam,
x_0 = proportion of steam in vapor.

The surface-condensing calorimeter is similar in principle to the barrel or tank calorimeter, with the

exception that the water does not come in contact with the steam to be condensed. As a rule, the steam is passed through a metallic coil, which is immersed in water. The steam coming in contact with the cool surface is condensed into water and is collected at the outlet and weighed, its temperature being noted. The last temperature will in general be different from the final temperature of the water in the calorimeter. Making due allowance for this difference in temperature, we can write our heat equations for this form of calorimeter as follows:

$$W(x_s L_s + h_s - h_2) = w(h_1 - h)$$

$$\therefore x_s = \frac{w h_1 + W h_2 - w h - W h_s}{W L_s}$$

in which letters have same meaning as in former calorimeter description, and

t_2 = final temperature of steam
h_2 = heat of liquid in condensed steam.

The two types of calorimeter are not extremely accurate as they are liable to so many sources of error. The so-called throttling or superheating calorimeter is, on the other hand, extremely accurate within its range of operation. Let us suppose that we have saturated steam at 200 lb. absolute pressure, and that we admit some of this steam into a chamber and so throttle the valve controlling the entrance of the steam into this chamber that its pressure is kept fairly low—say atmospheric pressure of 14.7 lb. per sq. in.

Let us suppose that 3% of the saturated steam is moisture. At 200 lb. pressure, from the chart given in the last lecture, I find the latent heat of evaporation is 843.3 or for quality of .97, we have 818; and since the temperature is 382° F., the liquid heat is 354.4, thus making the total heat 1172.4. When this steam is so throttled that the pressure becomes lowered to 14.7 lb. per sq. in., the total heat is 1150.4. The difference between 1172.4 and 1150.4 is 22 B.t.u. This heat being liberated from the steam at higher pressure when reduced to lower pressure must be felt in the physical state of the steam at the lower pressure. Hence the steam must be superheated. We found in the last lecture that the specific heat of steam is a variable quantity, but let us suppose for illustration, that the mean specific heat is .48 in this case. Hence the steam would be superheated 22/48 or 45.8° F. Evidently, then, if we measure the temperature of the steam at the reduced pressure and note the two pressures we can compute the moisture in the steam, provided the steam is not so moist that all of the surplus heat is expended in evaporating the moisture without superheating it. The heat in the saturated steam must equal the heat in the superheated steam at the reduced pressure. Hence we have for the throttling or superheating calorimeter.

$$x_s L_s + h_s = H + k(T - t)$$

$$\therefore x_s = \frac{H + k(T - t) - h_s}{L_s}$$

Where

x_s = proportion of dry steam in saturated steam,
L_s = latent heat of saturated steam,
h_s = heat of liquid of saturated steam,
H = total heat of saturated steam at lower pressure,
k = mean specific heat (use .48 for first approx.),
T = temperature of superheated steam,
t = temperature of saturated steam at lower pressure.

It is seen that $x_s L_s + h_s$ must at least equal H, or we cannot determine x_s. In cases, then, of heavy moisture content in saturated steam, this form of calorimeter will not work without some additional data. If we can supply a definite known quantity of heat to the saturated steam, we can make this form of calorimeter accurate and positive for any degree of moisture. If then Q units of heat be supplied to the saturated steam, we shall have an equation as follows:

$$x_s L_s + h_s + Q = H + k(T - t)$$

$$\therefore x_s = \frac{H + k(T - t) - h_s - Q}{L_s}$$

The Barrus calorimeter makes use of this principle, and is found accurate and dependable.

Another form of moisture measuring device is the so-called separating calorimeter, which mechanically separates the water from the steam. The principle usually made use of in bringing this about is to suddenly change the velocity of the steam, allowing the steam in its changed direction to pass out through small perforations. As the water is more ponderous it cannot pass through sudden changes of direction and hence it falls into a cup beneath. The water is then weighed and the steam is either later condensed and weighed, or some other device used to measure its quantity. If

W = weight of steam free from moisture,
W_1 = weight of water free from steam,

$$\therefore x_s = \frac{W}{W + W_1}$$

The chemical calorimeter makes use of the well-known quality of common salt, that it will not go into solution when dry steam is passed over it, but, on the other hand, will rapidly absorb any moisture suspended in the steam.

In the electric calorimeter, the principle is the same as in the throttling calorimeter, in which a known quantity of heat is supplied to the saturated steam. In this case, however, the heat is supplied by an electric current. Fine german silver wires are passed through the saturated steam, and the voltage and amperage noted.. If E B.t.u. be supplied in this manner, we shall have

$$x_s L_s + h_s + E = H + k(T - t)$$

$$\text{or } x_s = \frac{H + k(T - t) - h_s - E}{L_s}$$

in which 1 B.t.u. = 17.59 watts per min.

During the year 1908, H. G. Stott and R. J. S. Pigott[1] performed a test on a 15,000 kw. steam-engine-turbine unit for the Interborough Rapid Transit Company which supplies power for the New York subway. Fig. 16 shows an illustration of ingenuity necessary to put through a test of this magnitude. No previous methods had been devised to measure the quality of low pressure steam. It was found that the ordinary perforated pipe sampler which is used to tap into the steam flow was absolutely worthless in giving a true sample. It was found necessary that the sample be taken from the main without changing its direction or velocity until it is safely in the sample pipe and entirely isolated from the rest of the steam.

[1]Trans. Amer. Inst. Elec. Engs., Vol. XXIX, Part 1, Page 222.

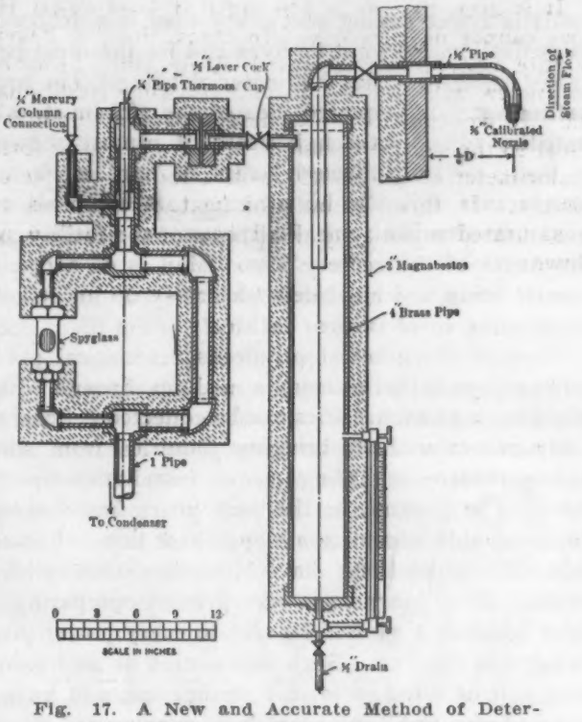


Fig. 17. A New and Accurate Method of Determining Moisture in Steam at Low Presures.

In Fig. 17, the ⅜ in. brass nozzle on the sampler is arranged to point in exactly the opposite direction to the steam flow; the lip of the nozzle is filed to a knife-edge to avoid disturbing the steam current around the sampler mouth by impact and eddies against a sensibly thick lip. If any sudden turn is made by the wet steam in entering the sample nozzle, the entrained moisture, by reason of its immensely greater specific gravity and slight skin friction will continue with unchanged direction and a dry sample will enter the nozzle. In other words, without proper care, the sampler becomes a very fair separator. The form of sampler shown in the figure takes out the sample without disturbing its direction, and the velocity can be kept correct by determining the flow from the following formula:

$$W = \frac{W\,a}{A}$$

Where

w = lb. per hr. flow through calorimeter,
W = lb. per hr. flow through steam main,
a = area of sampler nozzle,
A = area of main.

THERMOTWISTERS.

1. Steam at 100 lb. pressure is mixed with water at 100° F. The weight of the water increases from 10 to 11 lb. and its temperature rises to 197½° F. What is the percentage of dryness of the steam?

2. The same steam is condensed in and discharged from a coil, its temperature becoming 210°, and 10 lb. of surrounding water rise in temperature from 100° to 204¼°. Find the quality of the steam. What would have been an easier way of determining the quality?

3. What is the maximum percentage of wetness that can be measured in a throttling calorimeter in steam at 100 lb. pressure, if the discharge pressure is 30 lb.?

4. Steam at 100 lb. pressure has added to it from an external source 30 B.t.u. per pound. It is throttled to 30 lb. pressure, its temperature becoming 270.3° F. What was its dryness?

5. In the last problem, the added heat is from an electric current of 5 amperes provided for one minute, the voltage falling from 220 to 110. What was the amount of heat added and the percentage of dryness of the steam?

6. An engine consumes 10,000 lb. of dry steam per hour, the moisture having been completely eliminated by a receiver separator which at the end of one hour is found to contain 285 lb. of water. What was the dryness of the steam entering the separator?

Solution of Thermotwisters—Fourth Lecture..

1. A boiler evaporates 3000 lb. of water per hour from feed-water temperature of 200° F. to dry steam at 160 lb. pressure which corresponds to a temperature of 363.6° F. What is its horsepower?

$H = 1150 + 0.3745\,(t - 212) - 0.00055\,(t - 212)^2$, where $t = 363.6$

$\therefore H = 1150 + 0.3745 \times 151.6 - 0.00055 \times 151.6 \times 151.6$

$= 1194.2$ B.t.u.

Since the water enters the boiler at 200° F., it has already a heat of liquid amounting to 168.2 B.t.u. Hence net heat imparted to steam by boiler is $1194.2 - 168.2 = 1026.0$ per lb. Total heat imparted is therefore $3000 \times 1026 = 3{,}078{,}000$ B.t.u. One boiler horsepower is defined by A. S. M. E. as being such a boiler which will evaporate per hour 34½ lb. of water from and at 212° F. Each lb. of steam formed under such conditions requires 970.4 B.t.u. Hence 34½ lb. per hr. will require $34\frac{1}{2} \times 970.4$ B.t.u.. Therefore horsepower of boiler is

$$\frac{3{,}078{,}000}{34.5 \times 970.4} = 91.9 \text{ H.P.}$$

2. In the above problem what proportion of the whole heat in the fuel is carried away in the flue gases, if their temperature is 600° F., assuming the specific heats of the gases to be constant? The initial temperature of the fuel and air supplied is 0° F.

This problem cannot be solved directly without more definite data being given or assumptions made. Let us proceed to a general solution making necessary assumptions.

Let us assume average conditions; that is, that the boiler has an efficiency of 60%.

Energy in fuel per hour is then

$$\frac{3{,}078{,}000}{.60} = 5{,}130{,}000 \text{ B.t.u.}$$

Fuel supplied we will assume has calorific value of 14,000 B.t.u. per lb.

Hence lb. of fuel required per hr $= \dfrac{3{,}078{,}000}{.60 \times 14{,}000} = 366.4.$

To thoroughly consume each lb. of coal requires about 16 lb. of air. Hence 17 lb. of gas will be formed.

Hence total gas escaping per hr. is

$$\frac{3{,}078{,}000 \times 17}{.60 \times 14{,}000} = 6225.0 \text{ lb.}$$

The B.t.u. required to heat the gas from 0° F. to 600° F., assuming specific heat of .24, will be

$6225.0 \times 600 \times .24 = 897{,}000$ B.t.u.

Hence proportion of whole heat in fuel carried away is

$$\frac{897{,}000}{5{,}130{,}000} = 17.5\%. \quad \text{Ans.}$$

3. In the second problem, what would be the percentage of saving due to an economizer which reduced the gas temperature to 400° F?

Actual saving per lb. of gas escaping $=$
$(600 - 400) \times .24 = 48$ B.t.u.

Since there are 6225 lb. of gas escaping per hr., we have

$48 \times 6225 = 299{,}000.$

Since total heat given out by fuel is 5,130,000 B.t.u. the saving is

$$\frac{299{,}000}{5{,}130{,}000} = 5.83\%$$

Figuring on basis of actual B.t.u. delivered in the boiler, the saving becomes

$$\frac{299{,}000}{3{,}078{,}000} = 9.71\%$$

EXAMINATION FOR APPOINTMENT TO BUREAU OF STANDARDS.

The United States Civil Service Commission announces an examination on October 25-26, 1911, at the usual places, to secure eligibles from which to make certification to fill vacancies as they may occur in the position of aid, Bureau of Standards, Department of Commerce and Labor, at salaries of $600 and $720 per annum. Men only will be admitted to this examination. Graduation from a mechanical training, technical, or scientific school, or equivalent training in scientific or technical laboratories, is a prerequisite to appointment from this examination.

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POWER AND GAS

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Gathering Statistics

It is a true saying that every man is a debtor to his profession, for by it he lives and for the most part has his material being. The antiquated idea of the alchemist, who through years of utmost secrecy, through years of hard work and perseverance, failed in his attempt to accomplish any fruitful results, is a typical example of the futility and barrenness of the secrecy idea. Man is of necessity a social being and must depend largely on his fellows for any degree of success in life.

One of the greatest privileges a technical publication enjoys is that of being a medium through which valuable data and statistics can be collected.. Scarcely a day passes without bringing inquiries from some of our readers regarding power installation in the West. The Journal in the past years has amassed much valuable information along these lines. Eastern technical publications have likewise accomplished much. The Journal is at present preparing a letter which in time will be sent to every power plant manager in the west. Such information as we have on hand will be filled in for his verification, and he will be asked also to fill in vacant lines not covered by our present files. We do not hope to make this compilation in a minute. It will take months and perhaps years, but real value will be attached when so collected. Its publication from time to time will spread knowledge of practice and design that can be obtained in no other way. The data will always be readily accessible to any of our readers upon application.

The frank and open-hearted manner in which these requests have thus far been met by power managers assures us of their hearty support and co-operation.

Advertising Electricity

On page 346 will be found an article by W. H. Hodge, Jr., advertising manager of the H. M. Byllesby Co., on advertising electric service. The article is interesting in that it calls to mind the fact, that in the west the full effect of proper and consistent advertising on the part of the public service corporation, is not keenly felt. For instance, in the last issue of the Journal appeared an account of the investigating department maintained by the San Diego Consolidated Gas & Electric Company. The reader is shown the care and the painstaking energy employed to meet all complaints which come in from their consumers. The enormous reduction in percentage of complaints is the best evidence that the management is being many times repaid for the time and money outlay. Other corporations in other cities undoubtedly have effective complaint bureaus. The public should be informed of the efficient methods used, and less talk about the public service octopus trying to crush out the life of the dear public will be heard.

Again, the idea is very prevalent in many of the smaller municipalities that because a company is per-

haps the only one serving the community, it is but waste of time to advertise, for the customers will come in and sign up of their own accord. A manager working on such an hypothesis has failed to grasp some of the fundamental characteristics of his fellow-men. One of the characteristics he has failed to grasp is that ninety-five per cent of his fellow citizens are so infernally engaged in pursuing the almighty dollar they have no time to even consider a little theory and experimental data showing conclusively where money is lost often faster than they run it down by neglecting to change lamps at the end of their useful period, and by disregarding a proper and scientific installation of a few modern ideas. Nor does this manager realize that his prosperous neighbor who owns the big department store is so infernally busy putting over schemes during the day for advancing his sales influence, he has not time to consider that at night the mental makeup of the human being is such that, freed from cares and worries of the day, it becomes in a wonderfully receptive mood, ready to receive suggestive ideas. In a word such a manager has failed to place electric signs and thereby to utilize energies wasted during off-peak hours. His more progressive friend in the neighboring town by alert advertising has educated his customers in the use of the electric sign, thereby returning the money expended many times over by increased business sales and at the same time putting his newly organized public service corporation on a firm dividend-paying basis.

Is it a Knock or a Boost?

The clipping on "Lifting Magnets" appearing in these columns, on page 352, was sent us recently by one of our eastern readers, with the silent but impressive query attached: "Is it a knock or a boost?"

It is not the purpose of these columns to delve into subjects of a political nature. Hence it makes no difference where or by whom the lines were penned, be he socialist, republican, democrat or insurgent. The jilt carefully framed against invention in the article referred to strikes deeper than party or creed. It strikes at the very fundamental makeup of modern civilization—nay, it strikes still deeper—even at the very why and wherefore of our creation. It silently asks the question whether the fruits of the struggle of brains and industry are after all worth while.

Only the Almighty, himself, can answer such profound questions. We come into this world naked and bare and when mature age arrives find ourselves born to earth and bound to earth. In this beautiful, happy world of ours, if we do not have the proper focus on its makeup, we pass up and down the mournful streets, view the sorrows, the disappointments, the shabby pretense, the struggle on all sides for the elusive phantom known as happiness, and, were it not for that inborn indescribable something which spurs us on, giving hope and promise of things better for the future, we might well drop out of the race before the ring of the starter's pistol-shot dies away..

But there is something within us that spurs us on, something that gives hope and promise in the sound of children's voices in the clamor and clanging of a busy industry, in the realization that by struggle of brains and intellect the final outcome of invention will raise the human race to the level of the great creator himself, and thus work out the unsolved problems of the ages.

The rapidity with which the products of invention have taken over the burdens of mankind has had a tendency at times to unbalance certain supply and demand relations in the labor problem. During a period thereafter unquestionably distress and want are felt until the readjustment of affairs can once again be brought about. The experience of the past has demonstrated that in time the re-adjustment is complete. Although the advent of the cotton-gin, the sewing machine, and the myriad other labor-saving devices, temporarily displaced thousands of laborers, eventually they so increased the demand for manufactured products that even tens of thousands are today employed in the same industries. Our patent laws are so drawn that all monopolies of patent ideas in time are annulled and the inventions become the free property of the people, and by application of these ideas and still further refined inventive additions, the human race will be immeasurably raised above our shivering, cave-dwelling ancestors of the stone age into a plane approaching equality with that of the great creator of all things.

As for us practical, everyday working men, let us remember that while we are engaged in this busy struggle, this struggle of advance through brains and intellect, let us not forget that the very effort itself is making for each individual so engaged an inner happiness in thorough harmony and synchronism with the inborn spark of life. Whether the ultimate aims will be reached is immaterial for happiness. We can but live in the present day before us, and the cynic can content himself when living in this way, with the philosophy of Shakespeare, which tells us, "That all things that are, are with more spirit chased than enjoyed."

But for the optimistic being!!

Let us work and work and work. Let us build into our great Western Empire the wholesome spirit that has always pervaded its very god-given freedom and promise. Let us unselfishly work for progress, work for invention, work for all things that are good and wholesome, and let us find our reward in the words of Kipling:

"And only the Master shall praise us, and only the Master shall blame;
And no one shall work for money, and no one shall work for fame,
But each for the joy of the working and each in his separate star,
Shall draw the Thing as he sees It for the God of Things as They Are."

PERSONALS.

J. W. White, of the Fort Wayne Electric Works' sales department, is on a tour of Nevada.

F. B. Gleason, manager of the Pacific Coast branch of the Western Electric Company, is at Los Angeles.

R. D. Holabird, president of the Holabird-Reynolds Company, leaves on Saturday for an Eastern trip.

Harry Tittle, superintendent for the John G. Sutton Company, returned from Vancouver during the past week.

F. H. Poss, Pacific Coast manager for the Holophane Company and the Benjamin Electric Company, is at Los Angeles.

R. S. Buck, of the firm of Sanderson & Porter, is again at New York, after spending some time in Idaho on engineering work.

F. O. Alton has arrived from the East and joined the motor sales department of the General Electric Company's San Francisco office.

George Cole, of the John R. Cole Company, is expected to return from a month's visit to the Eastern factories about November 1st.

F. W. Gay, of J. G. White & Co.'s engineering staff, has returned to the San Francisco office after spending several weeks at New York.

O. K. Jones, formerly an inspector in the San Francisco Department of Electricity, has joined the sales department of the Aylsworth Agencies Company.

Carl M. Bernagen, president of the Keuffel & Esser Co., manufacturers and distributors of mechanical drafting instruments, is making a tour of the Northwest.

Herbert Smith of the Safety Insulated Wire & Cable Company, is visiting the Eastern factory. E. A. Freeman recently joined the company's San Francisco sales force.

Rudolph W. Van Norden, consulting engineer, has returned to San Francisco from an inspection of the Coleman plant of the Northern California Power Company.

Thomas Mirk and K. G. Dunn, of Hunt, Mirk & Co., are at San Diego on business connected with the extension of the San Diego Electric Railway Company's power plant.

S. L. Sinclair, a recent arrival from Pittsburg, has joined the sales force of the Westinghouse Electric & Manufacturing Company, to fill the position of H. F. Fisher, resigned.

Jack Hyer, formerly connected with the municipal electrical inspection department, has returned to San Francisco from an Eastern trip and taken up an agency for electrical goods.

Hans Pederson, contractor, Seattle, who is constructing a portion of Tacoma's Nisqually power plant, announces that he will soon begin pouring concrete for the floor base of the reservoir at La Grande.

John L. Hartman, president of the Atlas Foundry & Machine Company, of Tacoma, after an enjoyable three months' Eastern tour, is at home again and prouder than ever of prospects in the Northwest.

S. Wyman Rolph, manager of the Holabird Electric Company of Seattle, is now at San Francisco, and is receiving the congratulations of his friends on the arrival of a new son at the family home at San Mateo.

E. A. Heron, president of the Oakland Railway Co.; W. R. Alberger, vice-president and James Potter, superintendent, are in the East on business. The latter is attending the National Street Railway Convention at Atlantic City, N. J.

H. F. Fischer has resigned from the sales department of the Westinghouse Electric Manufacturing Company to accept a position in the electrical engineering department of the University of California at Berkeley.

Edward Sawyer, president and general manager of the Atlantic Insulated Wire & Cable Company, spent the past week at San Francisco with Hand & Jones, the Company's Coast representative. Mr. Sawyer is returning East by way of Portland, Seattle, Spokane and Butte.

Robert Edwards, Jr., affectionately called "Bob" and "Major," by his personal and business acquaintances, and one of the most prominent men in the electrical field, has recently acquired the control of Edwards & Company.

A. C. Wales, who has been San Francisco manager for the Nernst Lamp Company for the past four years, will leave for the East next week to become manager of the Chicago branch. Ira J. Wolfe, formerly cashier, has been promoted to the management of the company's San Francisco office.

C. L. Cory, Dean of the Mechanics College of the University of California, acted as the jovial toastmaster at the recent banquet of the Associated Mechanical and Electrical Engineers of the State University. The organization comprises the two upper classes in mechanical and electrical engineering.

E. H. Coolidge, general commercial superintendent of the Pacific Telephone and Telegraph Company; C. W. Burkett, general superintendent of plant, and D. P. Fullerton, division superintendent of plant, have returned to San Francisco after making a 900-mile automobile inspection of Central Nevada with a view to future extensions.

Harry T. Cory, civil engineer and brother of the well known consulting engineer, C. L. Cory, has taken unto himself a bride. Mr. Cory was thought to be bullet proof, but the personal magnetism of southern California has proved the victor and reports from south of Tehachapi indicate he is not only to be forgiven for violating the vows of celibacy, but sincere congratulations are in order.

George J. Henry Jr., engineer for the Pelton Water Wheel Company, gave recently an interesting after-dinner speech at the annual banquet of the Associated Mechanical & Electrical Engineers of the University of California, in which he depicted many amusing incidents met with by the engineer in gaining practical experience after graduation. Mr. Henry is a graduate of the University of California..

ELECTRICAL CONTRACTORS' NOTES

Frank Somers, manager Century Electric Company, San Jose, was in San Francisco recently.

Noble Powell of Stockton was in San Francisco recently and says that a great deal of small work is being done in Stockton.

C. V. Schneider, manager of the Electric Supply Company of Sacramento, is in San Francisco and reports business good in Sacramento.

Charles E. Sloan, of Sloan & Robson, has returned to San Francisco from Alturas, Modoc County, where the firm has had charge of engineering work.

H. V. Reid, manager electrical department of the Pacific Fire Extinguisher Company, has just returned from Portland, where he signed up a large electrical contract.

The electrical work is now being figured for the new Mount Zion Hospital, at Fulton and Devisadero streets. The estimates are in the neighborhood of $15,000

Figures are being taken for the electrical work on the Downtown Realty Theatre, at Eddy and Mason streets. It is estimated that about $15,000 will be spent on electrical wiring and apparatus.

Cunningham & Polito are taking bids for wiring on Ike Kohn's new reinforced concrete building on the corner of Van Ness avenue and Sutter street. The estimated cost of the electrical work is about $5000.

"Pop" Boynton, manager of the Central Electric Company, of Los Angeles and San Francisco, has just returned from the south and is busy explaining to his friends that it was business and not baseball that took him south. "Pop" rarely misses a game. He reports business good in the south.

INDUSTRIAL

A NEW FOUR AND EIGHT-BUTTON INTER-PHONE SET FOR SELECTIVE RINGING, COMMON TALKING, PRIVATE LINE SERVICE.

The Western Electric Company recently placed on the market a new line of inter-phones which will fill a long-felt want in residences, factories, schools and mercantile establishments where intercommunication between stations is not so frequent as to require separate lines.

These sets are arranged for selective ringing, common talking service, that is, any station may call any other station without interfering with any of the others. These sets are designed for use where conversation between two parties at one time is all that is required. They will give just as satisfactory service as the individual-line type gives on large 24-line systems, where often two or more conversations are necessary at the same time. They are made in capacities of four and eight buttons, which will accommodate five and eight parties, respectively.

Improved Type of Interphone Set.

Fig. 1 shows the eight-button set, known as the No. 1327-L. This is a non-flush wall set, but a desk type is also furnished when desired. The standard finish for the 1327-L type sets is oak, but other wood finishes can be supplied to order. The instrument through compact is not crowded, and the apparatus is arranged so as to make installation easy, as only one set of batteries is required for the whole system. The instruments are so simple in construction that there is little chance of their getting out of order, and the maintenance expense of the system is practically negligible. This system is recommended where a simple yet reliable means of communication is required at a low cost.

ROTARY CONVERTERS FOR MINING SERVICE.

Rotary converters are being used in many coal and metal mines. Direct current is necessary for the operation of mining locomotives because alternating-current motors cannot satisfy the speed and space requirements. Alternating current is used for the transmission of the energy from the steam or hydroelectric generating stations to the mines, and the rotary converter is the logical machine for efficiently converting the alternating to direct current at the point where the energy is to be used.

Several public service companies in both Pennsylvania and in Colorado are making a specialty of supplying mines with alternating-current energy and are developing excellent mining loads. The larger mining companies find it economical to establish steam or hydraulic generating stations at points where energy can be generated cheaply and to transmit

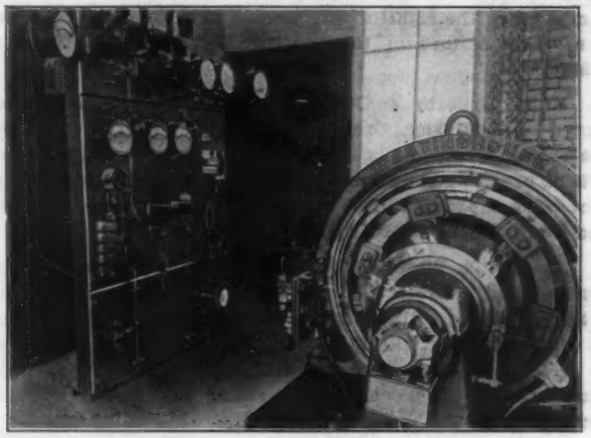

Fig. 1. Rotary Converter Substation at Mine No. 22 of the Consolidated Coal Co., 150 kw., 275 volts direct current, 3 phase, 60 cycles, 1200 r.p.m., rotary converter.

it as high-tension alternating current to the mine or group of mines where it is utilized. Whether alternating energy is generated by a public service company or by the mining company, experience shows the rotary converter to be an efficient, reliable machine for converting the alternating to direct current. A nominal voltage of either 275 or 600 is adopted for the direct-current distribution systems within the mines.

A good example of a mining plant rotary converter installation is shown in Fig. 1, which is a view of the substation at Mine No. 22 of the Consolidated Coal Company of Pennsylvania. This station received energy as alternating current at 2300 volts, three phase, 60 cycles. The pressure is stepped to 158 volts for the alternating side of the Westinghouse 150 kw. rotary and is delivered therefrom as direct current at 275 volts. A standard Westinghouse black marine finished switchboard, carrying the usual switch gear and instruments, controls the incoming alternating-current line, the rotary converter and the outgoing direct-current feeders, which radiate to different parts of the property.

TRADE NOTES.

The Vancouver Lumber Company of Vancouver, B. C., have recently placed an order with the Allis Chalmers Company for one 750 kw. low pressure turbine and a number of motors for their planing mill at Vancouver.

The Agutter Griswold Company of Seattle have been awarded the contract to do the wiring and furnish the necessary switchboards for the new 42-story Smith Building, to be erected in Seattle. Work on this building has commenced.

The British Canadian Lumber Company of Vancouver, B. C., have just completed plans and specifications for their new mill they are to build. The electrical requirements will include a 1500 kw. generator, a number of motors and switchboards.

Machado & Roller of New York City, whose Pacific Coast representatives are Otis & Squires, of San Francisco, have taken the sole agency in this country for the Columbia high

torque induction meters. Otis & Squires will have a full stock of both this house and switchboard types.

Among orders recently received by the Railway Department, General Electric Company, Schenectady, N. Y., is that of the Pacific Electric Railway Company, Los Angeles, Cal., for 1 motor generator set; 1 17 kw.-500-125 v. exciter; 3 WC. 60-540-15000/13500-2250 v. Core type transformers.

McDonald & McDougal, railroad contractors who have the contract for constructing the Oregon electric extension from Albany to Salem, Oregon, have established a number of camps along the right of way preparatory to active construction. One feature of the construction will be a 7000-foot bridge.

H. M. Byllesby & Company of Chicago has under construction at Albany, Oregon, the largest filtration plant in the State. The plant is for the Oregon Power Company and will be used in connection with Albany's municipal water system. The capacity will be 2,250,000 gallons of water per day and there will be 40,000 square feet of filter area.

The Pelton Water Wheel Company has sold to the Montesano Light & Water Co., a 315 h.p. cylindrical case Pelton-Francis turbine, with an extended base to carry a generator on either side. It will operate at 600 r.p.m. under a head of 65 feet and will be connected to two generators by friction clutches. The load consists of lighting and motors at Montesano, Wash.

J. C. Farrar & Co., Pacific Coast agents Electrical Engineers' Equipment Company, report the sale of twelve 25,000 volt, triple conductor cable end bells for outside service on lead-covered, steel-band armored submarine cables to the Great Western Power Company; two 13,000 volt triple conductor cable end bells for outside service to the Northern California Power Company, and a quantity of switchboard frame fittings and bus bar supports to Stone & Webster at Reno and Verdi, Nev.

Among the recent large contracts received by the Westinghouse Electric & Manufacturing Company was one granted by the commission government of the city of Tacoma, Washington, for the entire switchboard and auxiliary apparatus for the power house, substation and transmission line of the 27,000 horsepower hydroelectric plant the city is erecting. The plant is located about seven miles from the city of Tacoma on the Nisqually River, and electrical energy will be transmitted at 55,000 volts for furnishing light, power and railways in the city and vicinity.

NEW CATALOGS.

The Wheeler Condensing & Engineering Company of Carteret, New Jersey, has just issued Bulletin No. 103, which treats of Wheeler-Edwards air pumps in a very interesting and attractive manner.

The Sterling Electrical Mfg. Co., of Warren, Ohio, has just issued a series of leaflets on incandescent electric lamps of the Sterling design. The leaflets deal with descriptions and price quotations of standard lamps handled by the company.

The Electric Storage Battery Company of Philadelphia has just published the fourth edition of their hand book "IP" on the "chloride accumulator" for use in 110 volt isolated lighting and power plants. The booklet is interesting and attractive.

The Crocker-Wheeler Company of Ampere, N. J., have just published a booklet on induction motors, which clearly and concisely explains their patented magnetic bridges and how these bridges add to the motor's operating characteristics, mechanical durability and convenience.

The Shelby Electric Company of Shelby, Ohio, has an interesting catalog on Shelby Lamps. A second booklet entitled The Fortress of Lamp Quality, has also just been published, and is profitable reading for anyone interested in the development of the great lamp industry.

"Common Battery vs. Local Battery Operation for the Small Exchange" is the title of the new Bulletin No. 1017 which has just been issued by the Western Electric Company. This is one of the most interesting and instructive bulletins ever put out by a manufacturing company. It compares central and local battery equipment from a service and cost standpoint.

The Allis-Chalmers Company of Milwaukee has published an interesting series of new catalogs. Bulletin No. 1070 deals with Type B. Barometric Condensers, while No. 1519 deals with Type AN Barometric Condensers. Bulletin No. 1083 is concerned with direct current motors and generators, while alternating current generators are discussed in No. 1078. Engine driven direct current generators of types "T" and "TW" are described in No. 1082 and direct current motors and generators of type "H" and "HT" in No. 1074. Direct connected Corliss engines of the "Reliance" pattern are taken up in Bulletin No. 1068.

Very little has been done to explain to the everyday telephone user—the blacksmith, the storekeeper, especially in smaller towns and villages—the simple facts of why such and such rates were made, and why they are necessary to-day. In other words, a booklet that is of mutual benefit to operator and subscriber because it tells the subscriber the economy of better service. That is precisely the purpose of a new publication, just issued by the Kellogg Switchboard & Supply Co. It is written by a practical man, Mr. H. N. Faris, of long and wide experience in the telephone field—experience that is of great value to the operator of any size exchange.

The General Electric Company has recently issued some interesting and attractive catalogues. Bulletin No. 4859 describes the line of synchronous condensers especially adapted for floating on the line for improving the power factor. These condensers have been designed to meet the demand for a comparatively inexpensive high speed machine of this nature. Bulletin No. 4877 is devoted to direct current switchboard panels, single polarity, for small mining plants. Bulletin No. 4882 describes Enclosed Flame Arc Lamps. This lamp utilizes the impregnated, or so-called plain carbon electrode which gives remarkable illuminating efficiency. Bulletin No. 4871 describes the General Electric Company's mercury arc rectifiers for battery charging, and supersedes that Company's previous bulletin on the subject. Bulletin No. 4857 thoroughly describes its switchboard and high tension relays. Among these relays are those for circuit-opening, time-limit relays, inverse time-limit, definite time-limit, low voltage, no-voltage and over-load, reverse current, reverse phase. Bulletin No. 4873, illustrates and describes in considerable detail that company's control apparatus for steel mills. Bulletin No. 4876. issued by the General Electric Company, on small plant direct current switchboards, illustrates and describes that company's 76-inch direct current panels designed for general use in small central stations and isolated plants.

ELECTRICAL ASSISTANT.

The United States Civil Service Commission announces an examination on November 22, 1911, to secure eligibles from which to make certification to fill vacancies as they may occur in the position of electrical assistant in the Signal Service at Large, War Department, and vacancies requiring similar qualifications as they may occur in any branch of the service, unless it shall be decided in the interest of the service to fill such vacancies by reinstatement, transfer, or promotion. The salary of electrical assistants in the Signal Service at Large is $1080 per annum.

NEWS NOTES

FINANCIAL.

LONG BEACH, CAL.—Water bonds amounting to $850,000 were formally turned over in Los Angeles to the Long Beach and Alamitos water companies, the successful bidders.

SALMON, IDAHO.—An ordinance is to be submitted to qualified electors and taxpayers of the city of Salmon, on the question of incurring an indebtedness on the part of the city, in the sum of $65,000.

FALLS CITY, ORE.—Falls City has desided, by a vote of 80 for and 21 against, to issue bonds to the amount of $5000 to extend the water system, pay the indebtedness and build a fire emergency reservoir.

ASTORIA, ORE.—The Astoria Water Commission has awarded to the S. A. Kean & Co., Chicago, the $80,000 5 per cent 20-year bonds issued for the making of improvements to the water system for $80,600.

ORANGE, CAL.—The City Council has passed an ordinance calling a special election to be held November 3 for voting on the question of issuing $50,000 bonds for the construction of improvements and extensions of the city water system.

LOS ANGELES, CAL.—The City Council has passed an ordinance ratifying and confirming the sale and delivery to Kountze Brothers and A. B. Leach & Company of New York City, of $408,000 water works bonds of the city, being part of the issue of $23,000,000 bonds authorized at the special election held June 12, 1907.

LOS ANGELES, CAL.—The first step toward regulating street car fares in this city was taken this week when the Council adopted the report of its legislative committee on the subject. The Board of Public Utilities and the city attorney were empowered to prepare an ordinance which will place in the hands of the board regulation of fares. Adoption of the proposed ordinance will give the Board of Public Utilities authority to compel local street railway corporations to render reports on their earnings and the valuation of their systems.

LOS ANGELES, CAL.—The finance committee of the City Council began consideration of one of the greatest municipal ownership projects in the country. It is proposed to issue $6,000,000 in bonds for the purchase of the Pacific Light & Power Company, the Los Angeles Gas & Electric Corporation and the Southern California Edison Company, whose combined distributing systems are valued at $8,500,000 by the companies. In case the companies refuse to sell it is proposed that the city lay its own conduits and parallel those of the three companies. The city will have a surplus of 150,000 h.p. from the Owens River aqueduct, the new water plant being brought 266 miles at a cost of $23,500,000, and this energy will be used in distributing light and power to the people, it is claimed at a much less cost than is now charged by the privately owned companies.

ILLUMINATION

ALBANY, ORE.—The Council has passed an ordinance granting to W. H. Goldrich a franchise to build a gas plant here.

PASCO, WASH.—A local contractor, R. Hammond, has been awarded the contract for installing three light poles for $4098.20.

TOPPENISH, WASH.—Immediate installation of four new street lights, of 2000 c.p. each, has been ordered by the City Council.

KENT, WASH.—Residents of the East hill, E. L. Hansen, R. R. Rotter and others, have asked that gas mains be extended to their places.

ALHAMBRA, CAL.—The Board of Trustees has passed an ordinance adopting the specifications for ornamental concrete lamp posts to be erected in this city.

MEDFORD, ORE.—The contract for the installation of cluster lights on Main street, has been awarded by the City Council to the Southern Oregon Electric Company.

SEATTLE, WASH.—Roy W. Comegys has made application to the Board of Commissioners of King County, Wash., for a franchise to use certain county roads and public places in the county for the construction and maintenance of an electric light system.

ANACORTES, WASH.—According to the intention of Messrs. Julius Nelson, J. P. Benton and E. D. Nelson, this city is to have a gas plant in running order before long and have applied for 30-year franchises before the council. They purpose to put in mains and materials in all parts of the city where they can procure customers.

MARYSVILLE, CAL.—The committee appointed by the Chamber of Commerce to raise funds for the building of the electric arches on D street, have completed their labors as far as D street is concerned. Contributions amounting to $5000 have been received. The committee is now engaged in raising money to build arches of the same kind at Third and E streets, and Third and V streets.

PULLMAN, WASH.—Recent additions to equipment at the State College of Washington include a 150 kilowatt direct connected alternator, driven by a Reliance Corliss engine. This unit is available for both power and experimental use. Also a 60 h.p. Weber gas engine is being installed with both up and down draft types of producers for an extended investigation of producer gas fuels of the Northwest. Sixty-five lamp posts of neat design and equipped with series tungsten lamps are being installed for campus lighting.

INCORPORATION.

OAKLAND, CAL.—The Sacramento Short Line and the San Jose Short Line have been incorporated with a capital stock of $10,000,000 by the former and $9,000,000 by the latter, by B. M. Aikens, R. P. Henshall, Luther Elkins, G. W. Mordecai, N. Schmulowitz, R. V. Whiting and F. L. Stewart.

PHOENIX, ARIZ.—The Arizona Construction & Finance Company with home office in Phoenix, has been incorporated with a capital stock of $2,000,000. The object of the company is the operation and maintenance of an electrical street railway. The directors are R. A. Lewis, W. B. Barr and S. D. Dunlap.

TWIN FALLS, IDAHO.—Articles of incorporation have been filed with the county recorder by the Twin Falls Railway Company. The capital stock is $500,000. The incorporators are I. B. Perrine, C. Smith, D. Moorman, E. Williams, A. Stafford of this city, and R. S. Buck and Raymond McCune of New York City.

PORTERVILLE, CAL.—Articles of incorporation of the Central Counties Gas Company were filed Saturday. The capitalization is $1,000,000. This is a Porterville controlled and promoted organization, which is to take over all the gas plants of the Southern San Joaquin Valley and place them under one management. Surveying work is now being done for a

high pressure line which is to be used as the supply for Strathmore, Ducor, Terra Bella, Tulare and possibly Dinuba.

TRANSMISSION.

VANCOUVER, WASH.—Two independent cables for the transmission of 1500 horsepower will be laid under the Columbia River by the Portland Railway, Light & Power Company, to furnish electricity for this city.

SAN JOSE, CAL.—The Great Western Power Company has made application to the Board of Supervisors for a franchise to erect lines for transmitting and distributing electriicty along the county roads in Santa Clara.

CORNING, CAL.—Mr. Forbes, construction engineer of the Sierra Light & Power Company, is here going over the lines of the local plant. He is now engaged in preparing plans for the entire reconstruction of the plant and line.

SACRAMENTO, CAL.—The Great Western Power Company has been granted permission to lay an underground wire system in Third and Fourth streets, K. to L. The application was presented by Attorney Hugh B. Bradford.

THE DALLES, ORE.—The Skamania Light & Power Company of Stevenson, Wash., desires to supply The Dalles with electricity for power and lights, and should it be given the privilege will sell at half price. S. Samson is president of the corporation.

HOOD RIVER, ORE.—The Hydroelectric Company of Hood River, which is having a preliminary survey made preparatory to starting work on a power and light plant here, has extended its operations to The Dalles and has applied for a franchise in that city.

OROVILLE, CAL.—The Great Western Power Company has purchased what are known as the Reuben Stover and Thad Stover ranches in upper Big Meadows. The Stover holdings comprise over 1000 acres of land, and their absorption by the big electric power corporation indicates that it is the desire of the latter to obtain control of practically all land in that valley.

DORRIS, CAL.—Dorris is jubilant over the announcement that the Siskiyou Electric Light & Power Company expects to furnish light and power services here within sixty days. The company's line now building through here will be the first to touch the town. The sub-station has already been erected and application has been made and bids advertised for the sale of said franchise through the corporate limits of the city. A 50-year franchise is asked.

PORTERVILLE, CAL.—C. H. Holley, chief engineer, is quoted as saying that the Tulare County Power Company will be delivering power to the patrons of the line not later than the 1st of April, and that contracts for the delivery of power at that date to the stockholders, are now being written. This concern is a co-operative organization and each share of stock carries with it an agreement from the company to deliver one horsepower of electricity annually. The substation from which the power is to be delivered to the orange district will be located at Strathmore, and work on this station is to be started shortly. Location has been secured in Tulare for a station which will supply the dairy district where a steam auxiliary will be located.

TRANSPORTATION.

VALLEJO, CAL.—Within a few days T. T. C. Gregory, president of the Vallejo & Northern, will advertise for bids for the Vallejo terminal improvements, which the company will make preparatory to beginning the construction of the new electric road from the bay to Sacramento. The company owns 24 acres of tide lands and it is proposed to build a bulkhead along the entire frontage.

SAN JOSE, CAL.—C. P. Anderson has applied to the Board of Supervisors of the County of Santa Clara, Cal., for a franchise to construct a single or double track standard gauge railroad in the county of Santa Clara, to be operated by electricity or gas.

RIVERSIDE, CAL.—The City Council will receive sealed bids up to October 31 for the purchase of a franchise granting the right to construct and for a period of forty-five years to maintain and operate a double track electric railroad on certain streets of the city.

PASADENA, CAL.—Material is on the ground for the construction of a cut-off from four track lines of the Pacific Electric Railway Company at Schutzen Park, through the hills to the Cawston Ostrich Farm. The company contemplates building a tunnel 1500 feet long where the hills are pierced.

CUCAMONGA, CAL.—Paul Shoup and William Pillsbury, officials of the Pacific Electric Railway Company, have been here looking over the proposed route for the trolley line. If the officials decide on the route, a free right of way will be given from the Ontario Colony through to Etiwanda, and they will be given 1000 cars of freight from the beginning.

SAN BERNARDINO, CAL.—The proposition of the Pacific Electric Company to build a car line into the northwest section of the city on F street, from Third to Seventh street, west on Seventh to Mt. Vernon avenue, north on Mt. Vernon to the city limits, in consideration of a bonus of $18,000, has been accepted by the property owners who are anxious for immediate construction.

SAN FRANCISCO, CAL.—Construction work on the Geary Street Municipal Railroad is being pushed rapidly ahead under the supervision of Superintendent Broderick and Public Works Commissioner Laumeister. Rails have been laid in Geary street from Fifth to Thirty-second avenue, and the concreting of the roadbed is under way. The trolley wires have been stretched along Geary street from Thirty-third avenue to Kearny street and on the first of October, Tenth avenue from Fulton street to Geary, was ready for the ties and rails.

SAN FRANCISCO, CAL.—At the annual meeting of stockholders of the Northern Electric Railway Company the directors were re-elected as follows: A. E. Boynton, E. J. de Sabla Jr., W. P. Hammon, P. B. Lilienthal, E R. Lilienthal, Joseph Sloss and Louis Sloss. The directors organized by re-electing officers as follows: E. R. Lilienthal, president; E. J. de Sabla, Jr. and Louis Sloss, vice-presidents; Norman Logan, secretary, This company was organized in 1907 as a consolidation of the Northern Electric, Chico Street Railroad, Shasta Southern Railroad, Redding and Red Bluff Railroad, Marysville and Yuba City Street Railway. It operates from Sacramento to Chico via Oroville and from Chico to Hamilton, 130 miles in all. The capitalization is $25,000,000, of which $10,000,000 is preferred non-cumulative 5 per cent; earnings are steadily increasing, and the company is in good financial condition.

WOODLAND, CAL.—At a meeting of the executive committee of the Sacramento Valley Electric Railroad, or, as it is called by some, the Woodland-Red Bluff Electric railroad, held in this city this week, Attorney A. C. Huston of Woodland was instructed to prepare applications for franchises through Yolo, Colusa, Glenn and Tehama Counties as early as possible. Another matter of interest was the partial report of Engineer Melville Dozier on the preliminary survey. At the meeting were Charles L. Donohoe of Willows, president; E. L. Sisson of Red Bluff, secretary and J. Reith Jr. of Woodland, H. H. Earl, Attorney A. C. Huston and Engineer Dozier. Preliminary proceedings for the building of the road were discussed. Dozier, in his verbal report, stated his corps of engineers, had made surveys to a point a short distance above Maxwell, Colusa County. Four lines were surveyed out of Woodland before reaching the northern boundary.